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RESULTS AND INTERPRETATION OF ROCK ANCHOR TEST PROGRAM. EXISTIN--ETC(U)

JUL 79 J PEREZ , R A FASANO

DACW43-78-C-0005

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PHASE IV REPORT

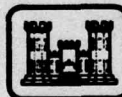
VOLUME VA

APPENDICES A THROUGH E

RESULTS AND INTERPRETATION OF ROCK ANCHOR TEST PROGRAM

EXISTING LOCKS AND DAM NO. 26
MISSISSIPPI RIVER, ALTON, ILLINOIS

Prepared for

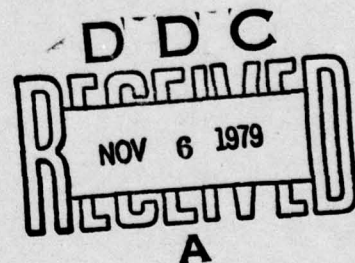


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PHASE IV REPORT
VOLUME VA
APPENDICES A THROUGH E

6 RESULTS AND INTERPRETATION OF
ROCK ANCHOR TEST PROGRAM.

EXISTING LOCKS AND DAM ~~NO~~ 26, *Number*
MISSISSIPPI RIVER, ALTON, ILLINOIS

Volume VA. Appendices A through E.

Prepared for



United States Army
Corps of Engineers
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Phase IV Report.

St. Louis District

By

9 *Final rept.,*

10 *JY*
Jean-Yves Perez

Ralph A. Fasano
Ralph A. Fasano

Woodward-Clyde Consultants
Chicago, Illinois

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<div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: 80%;"> Vol I Overview of Foundation Investigation and Test Program Vol II Results and Interpretation of Chemical Grouting Test Program Vol IIA Appendices A through G, Results and Interpretation of Chemical Grouting Test Program Vol III Results and Interpretation of Pile Driving Effects Test Program Vol IIIA Appendices H through T, Results and Interpretation of Pile Driving Effects Test Program Vol IV Results and Interpretation of Drilled-In Pile Test Program Vol IVA Appendices A through E, Results and Interpretation of Drilled-In Pile Test Program Vol V Results and Interpretation of Rock Anchor Test Program Vol VA Appendices A through E, Results and Interpretation of Rock Anchor Test Program </div>		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Lock and Dam No. 26, Mississippi River Timber piles Chemical grout test Alluvial sands Rock anchor test Benoto method Drilled-in pile test Instrumentation of tests Pile driving effects test Vibrational effects on structures		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) A series of tests examining various foundation systems and construction techniques were conducted on Ellis Island near Locks and Dam No. 26 in alluvial sand deposits underlain by glacial deposits and limestone. The chemical grout test consisted of grouting the upper 20 feet of the alluvial sand by injecting a number of different silicate and cement-bentonite grout types, while varying the grouting method, hole spacing, and injecting rates. Heave, lateral displacement, and pore pressure were monitored during grout injection. The in situ properties of the sand were measured before and after grouting by standard		

20. penetration tests, static cone penetration tests, pressuremeter tests, bore hole permeability tests, and shear wave velocity tests. Concurrently laboratory tests were conducted to investigate the strength and creep behavior of the grouted sand. After completion of grouting, the site was excavated to examine and evaluate the grouted sand. In the rock anchor test, inclined rock anchors were installed in limestone through 130 feet of alluvial and glacial deposits using a pneumatic down-the-hole hammer with an offset reamer. Load tests were conducted on three instrumentated rock anchors and the feasibility of installation of the rock anchors was determined by evaluating loss of ground during installation, performance of the installation equipment, and rate of installation. The drilled-in pile test consisted of installation of large diameter high capacity pipe piles by the Benoto method. The feasibility of installing these piles was determined by evaluating loss of ground during installation, performance of the Benoto equipment, and rate of installation. In the pile driving effects test, pile founded monoliths were constructed, supported on either one, eight or twelve timber piles jettied and driven in alluvial sand to a depth of 35 feet. After applying lateral and vertical load to the monoliths, steel piles were driven at varying distances from the monoliths while monitoring movement of the monolith and supporting piles; shear, moment, and axial load in the timber piles; and pore pressure, movement, and particle velocity, in the soil. Parameters examined were pile type being driven (sheet, pipe, or H-pile), pile driving hammer (diesel, air-steam, or vibratory), distance of driven piles from monolith, driving of multiple piles at the same distance from the monolith, load level applied to the monolith, and soil properties (grouted and ungrouted). Vertical and lateral load tests were conducted on each pile founded monolith. Tests were also conducted to assess what effect grouted soil has on piles. Piles were driven in both grouted and ungrouted sand to examine driving characteristics and lateral load tests were conducted on H and pipe piles in both grouted and ungrouted sand.

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**RESULTS AND INTERPRETATION OF
ROCK ANCHOR TEST PROGRAM**

VOLUME VA

Appendix A	ANCHOR LOAD TEST DATA SHEETS
Appendix B	DRILLING PRODUCTION LOGS
Appendix C	GROUND INSTRUMENTATION DATA SHEETS
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PHASE IV REPORT

VOLUME VA

**RESULTS AND INTERPRETATION OF
ROCK ANCHOR TEST PROGRAM**

APPENDIX A

ANCHOR LOAD TEST DATA SHEETS

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WOODWARD-CLYDE CONSULTANTS
 LOCKS AND DAM NO. 28
 ROCK ANCHOR TEST PROGRAM

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ROCK ANCHOR LOAD TEST
 ANCHOR NO. RP-1

Date	Time	Load Increment (kips)	JACK		LOAD CELL			ELONGATION			
			Pressure (lb/in. ²)	Load (kips)	Reading	Δ Reading	Load (kips)	PISTON		CALIPER	
								Reading	Displ. (in.)	Reading	Displ. (in.)
1978 Dec 20	1006	0	0	0	+			0.00			
	1007	30		30	-			seating			
	1009	10		10	250	250	initial 20	0.60	0.00	0.434	0.000
	1011	80	loaded	80	542	542	40	1.92	1.32	1.006	0.072
	1026	80		80	530	530	40	1.92	1.32	2.413	-
	1031	80		80	524	524	40	1.92	1.32	1.007	0.072
	1032	10		10	250	250	20	0.60	0.00	2.414	0.001
	1035	80	+ loads	80	535	535	40	1.92	1.32	1.009	0.072
	1045	160		160	854	854	70	3.96	1.36	2.415	0.002
	1048	10		10	270	270	20	0.72	0.12	0.703	0.009
										1.050	0.016
										2.859	0.055
										1.178	0.044

Remarks = (1) lower number indicates initial
 reading for each increment

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WOODWARD-CLYDE CONSULTANTS
LOCKS AND DAM NO. 26
ROCK ANCHOR TEST PROGRAM

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ROCK ANCHOR LOAD TEST
ANCHOR NO. RP-1

Date	Time	Load Increment (kips)	JACK		LOAD CELL			ELONGATION			
			Pressure (lb/in ²)	Load (kips)	Reading	Δ Reading	Load (kips)	PISTON		CALIPER	
								Reading	Displ (in.)	Reading	Displ (in.)
20 Dec	1115	10		10	269	269	20	0.72	0.12	1. 144	0. 710
	1124	80		80	640	640	45	2.40	1.80	1. 733	1. 299
	1126	160		160	872	872	75	4.32	3.72	2.616 2.545	2.182 —
	1130	160		160	868	868	75	4.26	3.66	2.616 2.547	2.182 0.002
	1134	160	not recorded	160	876	876	75	4.38	3.78	2.682 2.587	2.248 0.042
	1138	160		160	873	873	75	4.38	3.78	2.683 2.587	2.249 0.042
	1142	160		160	870	870	75	4.38	3.78	2.685 2.587	2.251 0.042
	1145	10		10	464	464	35	1.32	0.72	1. 631	1. 197
	1248	10		10	464	464	35	1.32	0.72	1. 635	1. 201
	1250	80		80	620	620	45	2.34	1.74	1. 950	1. 516

Remarks =

WOODWARD-CLYDE CONSULTANTS
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ROCK ANCHOR TEST PROGRAM

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ROCK ANCHOR LOAD TEST
ANCHOR NO. RP-1

Date	Time	Load Increment (kips)	JACK		LOAD CELL			ELONGATION			
			Pressure (lb/in ²)	Load (kips)	Reading	Δ Reading	Load (kips)	PISTON		CALIPER	
								Reading	Displ (in.)	Reading	Displ (in.)
20 Dec	1253	160		160	888	888	75	4.50	3.90	2. 850	2. 416
	1300	240		240	1108	1108	105	6.54	5.94	3.737 2.301	3.303 —
	1304	240		240	1089	1089	100	6.48	5.88	3.737 2.305	3.303 0.004
	1308	240		240	1084	1084	100	6.48	5.88	3.738 2.307	3.304 0.006
	1312	240	set rec'd	240	1082	1082	100	6.51	5.91	3.738 2.308	3.304 0.007
	1316	240		240	1081	1081	100	6.51	5.91	3.738 2.309	3.304 0.008
	1320	240		240	1080	1080	100	6.51	5.91	3.738 2.310	3.304 0.009
	1326	10		10	444	414	35	1.38	0.78	1. 882	1. 418
	1327	80		80	590	590	45	2.49	1.89	2. 165	1. 731
	1330	160		160	858	858	70	4.65	4.05	3. 150	2. 716

Remarks =

WOODWARD-CLYDE CONSULTANTS
LOCKS AND DAM NO. 26
ROCK ANCHOR TEST PROGRAM

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ROCK ANCHOR LOAD TEST
ANCHOR NO. RP-1

Date	Time	Load Increment (klps)	JACK		LOAD CELL			ELONGATION			
			Pressure (lb/in. ²)	Load (klps)	Reading	Δ Reading	Load (klps)	PISTON		CALIPER	
								Reading	Displ. (in.)	Reading	Displ. (in.)
20 Dec	1332	240		240	1092	1092	100	6.60	6.00	3. 850	3. 416
	1337	320		320	1318	1318	130	9.30	8.70	5.020 1.179	4.586 —
	1341	320		320	1300	1300	130	9.33	8.73	5.020 1.181	4.586 0.002
	1346	320		320	1294	1294	130	9.33	8.73	5.020 1.185	4.586 0.006
	1350	320		320	1290	1290	130	9.33	8.73	5.020 1.185	4.586 0.006
	1354	320		320	1286	1286	125	9.33	8.73	5.020 1.187	4.586 0.008
	1358	320		320	1284	1284	125	9.33	8.73	5.020 1.188	4.586 0.009
	1402	10		10	324	324	25	1.32	0.72	2. 092	1. 658
	1409	80		80	472	472	35	2.82	2.22	2. 502	2. 068
	1410	160		160	716	716	55	4.83	4.23	3. 371	2. 937

Remarks =

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WOODWARD-CLYDE CONSULTANTS
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ROCK ANCHOR TEST PROGRAM

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ROCK ANCHOR LOAD TEST
ANCHOR NO. RP-1

Date	Time	Load Increment (kips)	JACK		LOAD CELL			ELONGATION			
			Pressure (lb/in ²)	Load (kips)	Reading	Δ Reading	Load (kips)	PISTON		CALIPER	
								Reading	Displ (in.)	Reading	Displ (in.)
20 Dec	1412	240		240	960	760	85	6.32	5.12	4.164	3.730
	1414	320		320	1258	1258	125	9.06	8.46	4.994	4.560
	1415	400		400	1424	1424	145	11.37	10.77	6.155	5.716
	1419	400	not recorded	400	1383	1383	140	11.37	10.77	6.150	5.716
	1423	400		400	1374	1374	140	11.37	10.77	6.155	5.716
	1427	400		400	1369	1369	140	11.37	10.77	6.155	5.716
	1430	400		400	1398	1398	140	11.88	11.28	6.384	5.950
	1435	400		400	1380	1380	140	11.88	11.28	6.384	5.950
	1444	10		10	274	274	20	1.62	1.02	2.900	2.466
	1448	80		80	327	327	25	2.82	2.22	3.660	3.226

Remarks = 0 reset load on scale

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WOODWARD-CLYDE CONSULTANTS
LOCKS AND DAM NO. 28
ROCK ANCHOR TEST PROGRAM

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ROCK ANCHOR LOAD TEST ANCHOR NO.

Date	Time	Load Increment (kips)	JACK		LOAD CELL			ELONGATION			
			Pressure (lb/in ²)	Load (kips)	Reading	Δ Reading	Load (kips)	PISTON		CALIPER	
								Reading	Displ (in.)	Reading	Displ (in.)
20 Dec	1451	80		80	340	340	25	3.00	2.40	3.224	2.790
	1515	re setting		—	513	513	40	3.60	3.00	—	—
	1521	lock off		0	512	512	40	—	—	0.271	—
	1524	lift off		—	337	337	25	① 5.40	3.70	0.440	—
	1526	160	set + recorded	160	577	577	40	5.79	4.09	1.365	2.937 ②
	1528	240		240	792	792	65	7.20	5.50	2.176	3.748
	1530	320		320	1095	1095	100	8.46	6.76	3.435	5.007
	1532	400		400	1401	1401	140	12.45	10.75	4.560	6.132
	1535	480		480	1466	1466	150	14.10	12.40	5.146 1.591	6.718 —
	1539	480		480	1413	1413	145	14.10	12.40	5.146 1.589	6.718 6.002

Remarks = ① after re setting
= ② declared from test 160 k increment

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WOODWARD-CLYDE CONSULTANTS
LOCKS AND DAM NO. 28
ROCK ANCHOR TEST PROGRAM

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ROCK ANCHOR LOAD TEST
ANCHOR NO. 101

Date	Time	Load Increment (kips)	JACK		LOAD CELL			ELONGATION			
			Pressure (lb/in ²)	Load (kips)	Reading	Δ Reading	Load (kips)	PISTON		CALIPER	
								Reading	Displ (in.)	Reading	Displ (in.)
20 Dec	1541	480		480	1428	1428	145	14.58	12.88	5.300	6.922
	1543	480		480	1417	1417	145	14.58	12.88	5.300	6.922
	1547	480		480	1403	1403	140	14.58	12.88	5.350	6.922
	1549	480	+ recorded	480	1412	1412	145	15.00	13.30	5.716	7.288
	1555	480		480	1395	1395	140	15.00	13.30	5.716	7.288
	1600	480		480	1386	1386	140	15.00	13.30	5.716	7.288
	1605	480		480	1379	1379	140	15.00	13.30	5.716	7.288
	1612	400		400	1263	1263	130	13.80	12.10	5.101	6.993
	1614	320		320	1066	1066	100	11.52	9.82	4.615	6.217
	1615	240		240	795	795	60	8.76	7.06	3.514	5.056

Remarks = 0 reset load on jack

A-8

WOODWARD-CLYDE CONSULTANTS
 LOCKS AND DAM NO. 28
 ROCK ANCHOR TEST PROGRAM

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ROCK ANCHOR LOAD TEST
 ANCHOR NO. RP-1

Date	Time	Load Increment (kips)	JACK		LOAD CELL			ELONGATION			
			Pressure (lb/in. ²)	Load (kips)	Reading	Δ Reading	Load (kips)	PISTON		CALIPER	
								Reading	Displ (in.)	Reading	Displ (in.)
20 Dec	1616	160		160	567	567	40	7.14	5.44	2.706	4.278
	1618	80		80	385	385	30	4.26	2.56	1.869	3.441
	1622	160		160	538	538	40	7.12	5.42	2.365	3.937
	1630	240		240	671	671	50	7.56	5.86	2.843	4.415
	1631	320		320	925	925	80	9.99	8.29	3.803	5.375
	1633	400		400	1260	1260	125	12.57	10.87	5.011	6.583
	1639	400		400	1354	1354	135	13.89	12.19	5.530	7.102
	1658	400		400	1350	1350	135	13.86	12.16	5.541	7.113
	Jacking + lock off for hold at 400 k;										
	but chain + shims are unstable + kick										
	out; discontinue test										

Remarks

A-8.1

WOODWARD-CLYDE CONSULTANTS
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ROCK ANCHOR LOAD TEST
ANCHOR NO. RP-1

Date	Time	Load Increment (kips)	JACK		LOAD CELL			ELONGATION			
			Pressure (lb/in. ²)	Load (kips)	Reading	Δ Reading	Load (kips)	PISTON		CALIPER	
								Reading	Displ (in.)	Reading	Displ (in.)
1978 21 Dec	1320	0	0	0	+	1080	0	0.00	-		
	1321	80		① 75	1542	462	35	2.40	2.40		
	1322	160		150	1893	813	65	4.38	4.38		
	1324	240		226	2180	1100	100	6.72	6.72		
	1326	320	not recorded	301	2400	1320	130	9.03	9.03		
	1327	400		376	2515	1435	150	11.34	11.34		
	1331	400		376	2550	1470	155	-			
	1333	400		376	2570	1490	155	12.12	12.12	②	
	1337	400		376	2570	1490	155	12.12	12.12		
	1341	400		376	2553	1473	155	12.12	12.12		

Remarks ① Test load applied by the jack was reduced to account for 1 broken cable of anchor tendon; jack load = 16/17 load increment

② Limit of jack piston

A-8.2

WOODWARD-CLYDE CONSULTANTS
LOCKS AND DAM NO. 28
ROCK ANCHOR TEST PROGRAM

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ROCK ANCHOR LOAD TEST
ANCHOR NO. RP-1

1978

Date	Time	Load Increment (kips)	JACK		LOAD CELL # 61378-2			ELONGATION			
			Pressure (lb/in. ²)	Load (kips)	Reading	Δ Reading	Load (kips)	PISTON		CALIPER	
								Reading	Displ. (in.)	Reading	Displ. (in.)
21 Dec	1345	lock off		0	2944	1764	200	resetting			
	1347	lift off			2555	1475	155	jack piston			
	1351	-	not recorded		2529	1449	150	① 6.27	12.66		
	1354	400		376	2596	1515	160	6.87	13.26		
	1356	400		376	2632	1552	165	7.49	13.88		
	1407	400		376	2535	1455	150				
	1408	lock off		0	2830	1750	195				
	1410	withdraw piston			2980	1900	② 384.0				
	1412	long-term monitoring			2980	1900	384.0				
	1414				2980	1900	384.0				

Remarks ① After reset of jack piston
② Load on anchor during long-term
monitoring is based on mean trend
of load cell reading vs. jack load

A-8.3

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WOODWARD-CLYDE CONSULTANTS
 LOCKS AND DAM NO. 28
 ROCK ANCHOR TEST PROGRAM

ROCK ANCHOR LOAD TEST
 ANCHOR NO. RP-1

1978

Date	Time	Load Increment (kips)	JACK		LOAD CELL			ELONGATION			
			Pressure (lb/in ²)	Load (kips)	Reading	Δ Reading	Load (kips)	PISTON		CALIPER	
								Reading	Displ (in.)	Reading	Displ (in.)
21 Dec	1418				2979	1899	383.7				
	1420				2979	1899	383.7				
	1430				2979	1899	383.7				
	1440				2979	1899	383.7				
	1450				2977	1897	383.2				
	1500				2976	1896	382.8				
	1530				2975	1895	382.6				
	1630				2974	1894	382.1				
	1730				2971	1891	381.1				

Remarks =

A-8.4

WOODWARD-CLYDE CONSULTANTS
LOCKS AND DAM NO. 26
ROCK ANCHOR TEST PROGRAM

P. 4 of 6

ROCK ANCHOR LOAD TEST
ANCHOR NO. RP-1

Date	Time	Load Increment (kips)	JACK		LOAD CELL			ELONGATION			
			Pressure (lb/in. ²)	Load (kips)	Reading	Δ Reading	Load (kips)	PISTON		CALIPER	
								Reading	Displ (in.)	Reading	Displ (in.)
1978 21 Dec	1810				2970	1890	380.8				
	1910				2968	1888	380.2				
	2010				2968	1888	380.2				
	2110				2966	1886	379.5				
	2210				2965	1885	379.2				
	2310				2965	1885	379.2				
22 Dec	0010				2964	1884	378.9				
	0400				2960	1880	377.6				
	0800				2960	1880	377.6				
	1200				2960	1880	377.6				

Remarks =

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WOODWARD-CLYDE CONSULTANTS
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ROCK ANCHOR LOAD TEST
ANCHOR NO. RP-1

Date	Time	Load Air-Temp Increment (°F)	JACK		LOAD CELL			ELONGATION			
			Pressure (lb/in ²)	Load (kips)	Reading _i	Δ Reading	Load (kips)	PISTON		CALIPER	
								Reading	Displ (in.)	Reading	Displ (in.)
1978 22 Dec	1525	32			2967	1887	379.8				
23 Dec	1000	-			2966	1886	379.5				
24 Dec	1400	-			2950	1870	374.4				
26 Dec	1630	-			2944	1864	372.5				
27 Dec	1545	40			2948	1868	373.8				
28 Dec	1330	32			2943	1863	372.2				
30 Dec	1000	27			2940	1860	371.2				

Remarks =

A-8.6

WOODWARD-CLYDE CONSULTANTS
 LOCKS AND DAM NO. 28
 ROCK ANCHOR TEST PROGRAM

P. 6 of 6

ROCK ANCHOR LOAD TEST
 ANCHOR NO. RP-1

Date	Air Temp (°F) time	Load Increment (kips)	JACK		LOAD CELL			ELONGATION			
			Pressure (lb/in. ²)	Load (kips)	Reading ₁	Δ Reading	Load (kips)	PISTON		CALIPER	
								Reading	Displ (in.)	Reading	Displ (in.)
1979 8 Jan	15				2911	1831	361.9				
9 Jan	27				2969	1889	380.5				
10 Jan	22				2918	1838	364.2				
15 Jan	—				2918	1838	364.2				
27 Jan	30				2936	1856	369.9				
30 Jan	29				2904	1824	359.7				
7 Feb	15				2894	1814	356.5				
12 Feb	25				2904	1824	359.7				
3 Mar	50				2920	1840	364.8				

Remarks =

ROCK ANCHOR LOAD TEST
ANCHOR NO. RD-1

P. 1 of 2

Date	Time	JACK	LOAD CELL # 61378-1			ELONGATION			ANCHOR ZONE STRAIN							
			Load (lb)	Reading	Displ. (in.)	Reading	Displ. (in.)	Reading	TELLTALES (in.)				STRAIN GAGES (µε)			
									1	2	3	4	1	2	3	4
									Rdg. (lb.)	Rdg. (in.)	Rdg. (in.)	Rdg. (in.)	Rdg. (in.)	Rdg. (in.)	Rdg. (in.)	Rdg. (in.)
2 Feb	1400	0	0	+	0	1.30	0.22	1.032	2.814	2.961	2.904	2.798	-10	-11	-13	-5
	1415	10	890	1160	67	1.52	0.22	1.032								
	1428	80	725	85	1610	517	3.06	1.76	1.940	1.046						
	1433	"	"	"	1620	527	3.06	1.76	1.926	1.032						
	1444	10	150	15	1162	69	2.21	0.91	1.205	0.311	2.910	2.973				
	1449	80	650	75	1661	568	3.12	1.82	1.975	1.081	2.916	2.935	-10	-11	-13	-5
	1455	160	2400	295	2099	1006	6.40	5.10	5.150	4.236	①	①	400	255	292	296
	1500	80	400	45	1608	515	3.28	1.98	2.224	1.330	2.914	2.960	400	255	292	296
	1505	0	0	0	1106	13	2.09	0.79	1.034	0.140			401	258	294	294

Remarks: Load cell readout: Terrometrics P-350A # 9663
balanced at meter + 1000, ch. 9
g.f. 2, half bridge

Strain gage readout: Vishay P-350A # 21900
balanced at meter 10000, 35000 calibrator # 20086
bal pot. 5.45, g.f. 2, quarter bridge

① telltales # 1 & 2 bind on stressing head + break at end joint
decide to discontinue test

② load in upper box is based on Terrometrics calibration
" " lower " " " " of I

ROCK ANCHOR LOAD TEST
ANCHOR NO. RD-1

WOODWARD-CLYDE CONSULTANTS
LOCKS AND DAM NO. 28
ROCK ANCHOR TEST PROGRAM

[illegible]

REMARKS ① telltale rods 1 & 3 bind on stressing head & break at rod joint;
telltale rod 2 is pulled free accidentally
② load calculated from jack pressure doesn't match load cell,
decide to discontinue test
③ load in upper box based on Termonetics calibration
" " Power " " U of I

ROCK ANCHOR LOAD TEST
ANCHOR NO. RD-1

P. 1 of 13

Date	Time	Load Increment (kip)	JACK		LOAD CELL #61378-1		ELONGATION			ANCHOR ZONE STRAIN																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
			Pressure (lb./sq. in.)	Load (kip)	Reading	Load (kip)	PISTON		CALIPER		TELLTALES (in.)								STRAIN GAGES (µε)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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Remarks Seating to 300 psi, release to 200 psi & take initial readings

① Strain gage #3 checks & delay start of test to fix

Strain gage readout # 21900 meter + 0000
bal pot 5.5C, 350 ohm calibrator # 20086
gage factor 2, quarter bridge
Load cell readout # 9663, meter + 1000
ch 9, half bridge

A-11

Date	Time	Load Increment (kip)	JACK		LOAD CELL		ELONGATION			ANCHOR ZONE STRAIN																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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Remarks: Load maintained as per load cell reading using hand pump

Date	Time	Load Increment (kips)	JACK		LOAD CELL		ELONGATION			ANCHOR ZONE STRAIN																				
			Pressure (lb./sq. in.)	Load (kips)	Reading	Load (kips)	PISTON		CALIPER		TELLTALES (in.)								STRAIN GAGES (µε)											
							Reading	D. In.	Reading	D. In.	1		2		3		4		1		2		3		4					
											Rdg.	Displ. (in.)	Rdg.	Displ. (in.)	Rdg.	Displ. (in.)	Rdg.	Displ. (in.)	Rdg.	Displ. (in.)	Rdg.	Displ. (in.)	Rdg.	Displ. (in.)	Rdg.	Displ. (in.)	Rdg.	Displ. (in.)	Rdg.	Displ. (in.)
7 Feb	2033	240	1910	235	2236	1143	180	5.53	4.11	5.625	3.832	418	008	417	061	2.0	0.0	2.0	0.0	2.0	0.088	370	-10	-11	222	-18	-13	251	-5	-41
	2039	240	210	20	1320	227	35	1.96	0.54	2.270	0.477																			
	2043	90	725	80	1582	489	80	2.87	1.45	2.982	1.199																			
	2044	160	1350	160	1916	823	130	4.20	2.78	4.269	2.476																			
	2047	240	1950	240	2226	1133	180	5.48	4.06	5.489	3.696																			
	2054	320	2525	315	2606	1513	240	7.01	5.59	6.956	5.163																			
	2056	"	2550	320	"	"	"	7.01	5.59	6.961	5.168																			
	2058	"	2525	315	"	"	"	7.01	5.59	6.969	5.176																			
	2105	"	2520	315	"	"	"	7.01	5.59	6.953	5.160																			
	2110	"	2520	315	"	"	"	7.01	5.59	6.965	5.172																			
	2115	"	2520	315	"	"	"	7.01	5.59	6.969	5.176																			

Remarks

ROCK ANCHOR LOAD TEST
ANCHOR NO. RD-1

P. 4 of 13

Date	Time	Load Increment (kips)	JACK			LOAD CELL			ELONGATION			ANCHOR ZONE STRAIN															
			Pressure (lb./sq. in.)	Load (kips)	Load (kips)	Reading, kips	Reading, kips	Reading, kips	Piston Reading (in.)	Caliper Reading (in.)	Displ. (in.)	TELLTALES (in.)								STRAIN GAGES (µε)							
												1	2	3	4	1	2	3	4								
												Rdg.	Displ. (in.)	Rdg.	Displ. (in.)	Rdg.	Displ. (in.)	Rdg.	Displ. (in.)	Rdg.	Displ. (in.)	Rdg.	Displ. (in.)	Rdg.	Displ. (in.)	Rdg.	Displ. (in.)
Feb 7	2117	320	2525	315	2606	1513	240	7.01	5.59	6.966	5.173																
	2119	"	2525	315	"	"	"	7.01	5.59	6.969	5.176	2.493	0.67	2.465	0.13	0.672	0.197	0.465	0.001	-10	-28	-231	-11	-13	-50	268	-58
	2125	360	210	20	1320	227	35	1.95	0.53	2.255	0.462																
	2129	80	700	80	1585	492	80	2.90	1.48	2.991	1.198																
	2131	160	1350	160	1979	885	140	4.42	3.00	4.466	2.673																
	2133	240	1975	240	2300	1207	190	5.74	4.32	5.740	3.947																
	2135	320	2550	320	2621	1528	245	7.07	5.45	7.040	5.247																
	2137	400	3175	400	2963	1870	305	8.50	7.08	8.425	6.632																
	2139	"	3125	390	"	"	"	8.51	7.09	8.430	6.637																
	2143	"	3125	390	"	"	"	8.50	7.08	8.412	6.649																
	2145	"	3125	390	"	"	"	8.51	7.08	8.440	6.647																

Remarks

ANCHOR ZONE STRAIN																											
Date	Time	Load Increment (kip)	JACK		LOAD CELL		ELONGATION				TELLTALES (in.)								STRAIN GAGES (µε)								
			Load (kip)	Piston Reading	Load (kip)	Reading	Reading	PISTON CALIPER		1		2		3		4		1		2		3		4			
								Displ. (in.)	Rdg.	Displ. (in.)	Rdg.	Displ. (in.)	Rdg.	Displ. (in.)	Rdg.	Displ. (in.)	Rdg.	Displ. (in.)	Rdg.	Displ. (in.)	Rdg.	Displ. (in.)	Rdg.	Displ. (in.)	Rdg.	Displ. (in.)	Rdg.
7 Feb	2149	400	3125	390	2960	1967	305	0.09	7.07	8.44	6.65	0.0	2.0	0.0	2.0	0.0	2.0	0.0	2.0	-0.0	382	-30	235	-11	-13	-5	-62
	2200	"	3150	395	"	"	"	8.49	7.07	8.450	6.657																
	2230	"	3150	395	"	"	"	8.50	7.08	8.544	6.751																
	2300	"	3150	395	"	"	"	8.50	7.08	8.555	6.762																
	2330	"	3125	390	"	"	"	8.51	7.09	8.540	6.747																
	2400	"	3125	390	"	"	"	8.51	7.09	8.570	6.715																
8 Feb	0100	"	3125	390	"	"	"	8.51	7.09	8.530	6.737																
	0200	"	3125	390	"	"	"	8.51	7.09	8.545	6.752																
①	0300	"	3150	395	"	"	"	8.50	7.08	8.545	6.752																
②	0400	"	3150	395	"	"	"	8.52	7.10	8.560	6.767																
	0700	"	3125	390	"	"	"	8.53	7.11	8.830	6.767	③	see next page														

Remarks: ① Power to one heater off at 0230
② Power to other heater off at 0430
③ Telltale readout head binding, change wire hanger
caliper reading changes +0.270"

ROCK ANCHOR LOAD TEST
ANCHOR NO. RD-1

P. 6 of 13

ANCHOR ZONE STRAIN									
TELLTALES (in.)									
STRAIN GAGES (µε)									
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Remarks: ① dial gage set on jack piston for creep readings in (), decreasing dial
gage reading indicates elongation
Group 1 a.i.g. 2.378 - 11 (+0.075) #1
② reference strain gage readout bal pot 5.55
" load cell " ch. 9, +1000, half bridge

Date	Time	Load Increment (kips)	JACK		LOAD CELL		ELONGATION			ANCHOR ZONE STRAIN											
			Pressure (lb/in ²)	Load (kips)	Reading	Load (kips)	PISTON		CALIPER	TELLTALES (in.)								STRAIN GAGES (µε)			
							Reading	Dis. (in.)		1	2	3	4	1	2	3	4	1	2	3	4
9	1410	480	3790	480	3342	2249	370	10.16	8.74	16.320 (0.001)	8.257 (0.001)										
EL	1413	"	3790	480	"	"	"	10.16	8.74	10.327 (0.001)	8.264 (0.001)										
	1415	"	3790	480	"	"	"	10.16	8.74	10.316 (0.001)	8.253 (0.001)										
	1417	"	3790	480	"	"	"	10.16	8.74	16.325 (0.001)	8.262 (0.001)										
	1419	"	3790	480	"	"	"	10.17	8.75	10.327 (0.001)	8.264 (0.001)										
	1429	200	200	20	1285	192	30	2.01	0.59	2.0 (0.001)	0.543 (0.001)										
	1452	400	3150	395	2860	1967	300	8.71	7.29	8.942 (0.001)	6.879 (0.001)										
			start to place wedge & to lock off at position + reset piston																		

Remarks

ROCK ANCHOR LOAD TEST
ANCHOR NO. RD-1

P. 8 of 13

Date	Time	Load Cell	JACK			LOAD CELL			PISTON			CALIPER			ANCHOR ZONE STRAIN											
			Pressure (lb/in ²)	Temp (°F)	Reading	Reading	Reading	Temp (°F)	Reading	Temp (°F)	Reading	Temp (°F)	Reading	Temp (°F)	TELLTALES (in.)											
															STRAIN GAGES (µε)											
															1	2	3	4	1	2	3	4	1	2	3	4
															Reg. (in.)	Disp. (in.)	Reg. (in.)	Disp. (in.)	Reg. (in.)	Disp. (in.)	Reg. (in.)	Disp. (in.)	Reg. (in.)	Disp. (in.)	Reg. (in.)	Disp. (in.)
10 Feb	1345	400	3150	395	2845	1752	280	8.88	7.46	9.945	6.882															
	1400	lock off	0	0	1125	32	50	7.50	6.08	-	5.502															
					rebat	piston																				
	1600	lock off	0	0	1090	0	0	1.79	6.09	1.89	5.502				2. -0.2	0.2	0.2	0.2	-10	-11	-13	-5				
	1615	11.4 off	2600	320	2592	1499	240	-	-	-	-				2. 570	0.68	0.615	0.209	541	193	268	204				
	1617	-	3150	395	2877	1784	290	2.96	7.25	9.63	6.276				remove some wedges											
	1650	400	3275	410	2960	1967	300	3.22	7.51	2.23	6.536															
	1653	440	3810	480	3285	2192	360	4.48	8.77	4.74	7.787															
	1657	400	3190	400	2960	1967	300	3.91	8.20	1.34	7.447															
	1659	440	3815	485	3290	2197	360	4.53	8.92	5.56	7.969															
	1701	560	4425	560	3640	2547	430	5.87	10.16	9.64	9.177															

Remarks: ① new initial readings for piston & caliper
② rebalance strain gage readout
bal pot 5.37
rebalance load cell readout
ch 9, +1000, half bridge

ANCHOR ZONE STRAIN																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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10 Feb	1703	560	4425	560	3640	2547	430	5.87	10.16	5.830 (0.977)	-	5.877 (0.964)	9.190 (0.013)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					</

Remarks

ROCK ANCHOR LOAD TEST
ANCHOR NO. RD-1

P. 10 of 13

Date	Time	JACK			LOAD CELL			PISTON			ELONGATION		ANCHOR ZONE STRAIN															
		Load (kip)	Pressure (lb/in ²)	Load (kip)	Reading	Load (kip)	Reading	Reading	Displ. (in.)	Reading	Displ. (in.)	Displ. (in.)	TELLTALES (in.)								STRAIN GAGES (µε)							
													1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
10	1748	640	5000	635	4053	2960	510	748	11.77	7420	10.733	7.420	Reg. -0.173	Reg. 2.290	Reg. 0.148	Reg. 2.608	Reg. 0.216	Reg. 2.483	Reg. 2.135	Reg. -0.381	Reg. -10.229	Reg. -11.228	Reg. -13.166	Reg. -5.299	Reg. -10.390	Reg. -38.174	Reg. -13.312	Reg. -5.102
12	1754	400	3075	385	2960	1867	300	415	8.44	4.7968	6.55	4.7968																
	1905	400	3050	380	2960	1867	300	412	8.41	4.7851	6.55	4.7851																
	1908	480	3800	480	3342	2249	370	503	9.32	4.8311	6.55	4.8311																
	1910	560	4425	560	3640	2547	430	605	10.34	6.9345	6.55	6.9345																
	1912	640	5075	640	4053	2960	510	753	11.82	7.10803	7.10803	7.10803																
	1915	"	4975	630	"	"	"	752	11.81	7.10778	7.10778	7.10778																
	1917	720	5700	720	4500	3407	620	919	13.48	9.119	12.432	9.119																
	1922	"	5600	710	"	"	"	920	13.49	9.125	12.438	9.125																
	1926	"	5675	720	"	"	"	920	13.49	9.083	12.396	9.083																
	1932	"	5700	720	"	"	"	920	13.49	9.130	12.443	9.130																

Remarks: ① break for dinner

Q1001

A-21

ROCK ANCHOR LOAD TEST
ANCHOR NO. RD-1

[illegible]

Remarks: ① load set based on load cell

② load set based on jack pressure

③ elongation at 1st off backfigured from elongation at next 400k measurement

ROCK ANCHOR LOAD TEST
ANCHOR NO. RD-2

P. 1 of 12

Date	Time	Load Increment (Kips)	JACK	LOAD CELL # C1374-1		ELONGATION			ANCHOR ZONE STRAIN																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
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14 Feb	2128	0	0	0	(1093)	—	0	1.26	—	0.763	—																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									

Remarks: Seating to 375 psi, release to 200 psi + take initial readings

N.B.: 1 strand was broken during installation; this is a 24-strand anchor

① Strain gage readout # 21900, meter +0000
bal pot 51.52, 350-Ω calibrator # 20086
gage factor 2, quarter bridge

② Load cell readout # 2663, meter +1000
ch 2, half bridge

VSL jack eff area 127.6 in²

WOODWARD-CLYDE CONSULTANTS
LOCKS AND DAM NO. 28
ROCK ANCHOR TEST PROGRAM

ROCK ANCHOR LOAD TEST
ANCHOR NO. RD-2

P. 2 of 12

Date	Time	Load Increment (klps)	JACK		LOAD CELL		ELONGATION			ANCHOR ZONE STRAIN																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
			Pressure (lb/in ²)	Load (klps)	Reading	Reading	Load (klps)	PISTON		CALIPER		TELLTALES (in.)						STRAIN GAGES (µε)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
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15 Feb	0918	160	2025	250	2107	1014	160	7.13	4.82	(1.808)	(0.011)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											</

Remarks

A-25

ROCK ANCHOR LOAD TEST
ANCHOR NO. RD-2

WOODWARD-CLYDE CONSULTANTS
LOCKS AND DAM NO. 28
ROCK ANCHOR TEST PROGRAM

ANCHOR ZONE STRAIN																													
ELONGATION			TELLTALES (in.)								STRAIN GAGES (µε)																		
Date	Time	Load Increment (kips)	JACK		LOAD CELL		PISTON		CALIPER		1		2		3		4		1		2		3		4				
			Pressure (lb/in ²)	Load (kips)	Reading	Load (kips)	Reading	Dip (in.)	Reading	Dip (in.)	Reading	Dip (in.)	Dip (in.)	Rdg.	Dip (in.)	Rdg.	Dip (in.)	Rdg.	Dip (in.)	Rdg.	Dip (in.)	Rdg.	Dip (in.)	Rdg.	Dip (in.)	Rdg.	Dip (in.)		
15 Feb	0950	320	2650	330	2460	1367	220	881	6.50	(1.988)	(-0.003)																		
	0954	"	2590	320	"	"	220	881	6.50	(1.987)	(0.002)																		
	0958	"	2675	330	"	"	220	880	6.49	(1.987)	(-0.002)	0.	1.	2.	1.	2.	0.	2.	0.	-0.	-2.1	-3	-9	-13	-593	489	0	382	-2
	1015	320	2670	100	1148	55	10	249	0.18	2.195	0.167																		
	1020	90	1050	120	1605	512	80	467	2.36	4.120	2.122																		
	1022	160	2000	245	2107	1014	160	704	4.73	6.470	4.442																		
	1023	320	2700	335	2460	1367	220	876	6.45	8.037	6.039																		
	1026	400	3175	395	2710	1617	260	898	7.67	7.210	7.212																		
	1032	"	3075	385	"	"	"	10.02	7.71	(1.886)	(0.032)																		
	1034	"	3200	400	"	"	"	10.01	7.70	(1.892)	(0.026)																		
	1036	"	3200	400	"	"	"	10.00	7.69	(1.892)	(0.016)																		

Remarks

ANCHOR ZONE STRAIN																										
Date	Time	Load Increment (kips)	JACK		LOAD CELL			ELONGATION			TELLTALES (in.)								STRAIN GAGES (με)							
			Pressure (lb./sq. in.)	Load (kips)	Reading	Load (kips)	Reading	PISTON		CALIPER		1	2	3	4	1	2	3	4	1	2	3	4			
								Reading	Displ. (in.)	Reading	Displ. (in.)															
15 FEB.	1038	400	3190	395	2710	1617	260	10.00	7.69	(1.895) (0.021)																
	1040	"	3190	395	"	"	"	10.00	7.69	(1.895) (0.021)																
	1042	"	3150	395	"	"	"	10.00	7.70	(1.895) (0.021)																
	1044	"	3125	390	"	"	"	10.01	7.70	(1.895) (0.021)																
	1046	"	3150	395	"	"	"	10.01	7.70	(1.892) (0.021)																
	1048	"	3125	390	"	"	"	10.00	7.69	(1.895) (0.021)																
	1051	"	3125	390	"	"	"	10.01	7.70	(1.896) (0.021)																
	1053	"	3050	380	"	"	"	10.00	7.69	(1.899) (0.021)																
	1055	"	3100	390	"	"	"	10.00	7.69	(1.899) (0.021)																
	1057	"	3000	375	"	"	"	10.00	7.69	(1.899) (0.021)	0.1 (576)	1. (184)	2. (835)	-0. (336)	-0. (168)	-2.5 (795)	-2 (912)	-9 (249)	-13 (582)	-2 (7)						
	1105	"	3125	390	"	"	"	9.97	7.66	(1.910) (0.002)																

Remarks: ① Telltales cannot be read due to insufficient tension of DIA hole

Date	Time	Load (kip)	JACK	LOAD CELL			ELONGATION			ANCHOR ZONE STRAIN									
				Reading	Reading	Reading	Reading	Reading	Reading	TELLTALES (in.)					STRAIN GAGES (µε)				
										1	2	3	4	5	1	2	3	4	5
15	FEB	1110	400	3150	395	2710	1617	260	998	767	(1.904)(0.014)								
		1125	"	3150	395	"	"	"	997	766	(1.913)(0.005)								
		1145	"	3150	395	"	"	"	997	766	(1.917)(0.001)								
		1300	"	3150	395	"	"	"	996	765	(1.909)(0.009)								
		1400	"	3200	400	"	"	"	996	765	(1.917)(0.041)								
		1500	"	3175	395	"	"	"	998	767	(1.847)(0.071)								
		1600	"	3200	400	"	"	"	997	766	(1.817)(0.101)								
		1800	"	3150	395	"	"	"	999	768	(1.700)(0.147)								
		2100	"	3150	395	"	"	"	998	767	(1.732)(0.196)								
16	FEB	0000	"	3200	400	"	"	"	1000	769	(1.690)(0.225)								
		0300	"	3200	400	"	"	"	1005	774	(1.662)(0.254)								

Remarks: ① Reference head reset & another dial gage with a longer stem used, new dial gage has decreasing readings for extension, which is opposite from old dial gage; e.g. $(1.301 - (-0.245))$ for #4

ROCK ANCHOR LOAD TEST
ANCHOR NO. RD-2

P. 6 of 12

Date	Time	Load Increment (kip)	JACK	LOAD CELL		ELONGATION			ANCHOR ZONE STRAIN																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
				Reading	Load (kip)	PISTON		CALIPER	TELLTALES (in.)								STRAIN GAGES (µε)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
						Reading	Displ. (in.)		Reading	Displ. (in.)	1	2	3	4	1	2	3	4																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
Feb 8	0900	400	3100	390	2710	1617	260	10.00	7.69	9.255	7.252	3.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1.	1.	0.	0.	1

Remarks: ① Elongation at 1.5T off back figured from elongation at next 400 lb increment

Date	Time	Load Increment (kips)	JACK		LOAD CELL			ELONGATION			ANCHOR ZONE STRAIN																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
			Pressure (lb./sq. in.)	Load (kips)	Reading	Reading (kips)	PISTON		CALIPER		TELLTALES (in.)								STRAIN GAGES (µε)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
							Reading	Displ. (in.)	Reading	Displ. (in.)	1	2	3	4	1	2	3	4	1	2	3	4																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	

Remarks

Date	Time	JACK			LOAD CELL			ELONGATION			ANCHOR ZONE STRAIN															
		Load (kip)	Pressure (lb./sq. in.)	Load (kip)	Reading	Reading	Load (kip)	Reading	Displ. (in.)	Caliper	TELLTALES (in.)								STRAIN GAGES ($\mu\epsilon$)							
											1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
											Displ. (in.)	Displ. (in.)	Displ. (in.)	Displ. (in.)	Displ. (in.)	Displ. (in.)	Displ. (in.)	Displ. (in.)	Displ. (in.)	Displ. (in.)	Displ. (in.)	Displ. (in.)	Displ. (in.)	Displ. (in.)	Displ. (in.)	Displ. (in.)
16 Feb	1753	500	4400	560	3450	2357	390	5.30	11.04	(0.241) (0.006)																
	1757	"	4400	"	"	"	"	5.31	11.05	(1.209) (0.009)																
	1759	"	4400	"	"	"	"	5.31	11.05	4.209 (1.616) (1.256) (0.011)	3.0	1.1	0.1	1.1	-0.26	-2	-9	-13	-0.026	0.520	0.047	0.520	-0.26	-2	-9	-13
	1802	400	2975	370	2700	1617	260	2.30	8.04	1.932 (7.939)																
	1805	480	3525	480	3135	2042	330	3.92	9.66	3.346 (9.253)																
	1807	560	4375	555	3450	2357	390	5.29	11.03	4.697 (10.664)																
	1809	640	5025	635	3798	2705	465	6.96	12.70	6.357 (12.264)																
	1811	"	5010	635	"	"	"	6.96	12.70	(1.952) (-)																
	1813	"	5025	635	"	"	"	6.97	12.71	(1.945) (0.007)																
	1815	"	5050	640	"	"	"	6.97	12.71	(1.942) (0.010)																
	1817	"	5075	645	"	"	"	6.98	12.72	(1.936) (0.016)																

Remarks

WOODWARD-CLYDE CONSULTANTS
LOCKS AND DAM NO. 26
ROCK ANCHOR TEST PROGRAM

ROCK ANCHOR LOAD TEST
ANCHOR NO. RD-2

P. 2 of 12

Date	Time	Load (kips)	JACK		LOAD CELL		ELONGATION			ANCHOR ZONE STRAIN																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
			Pressure (lb./sq. in.)	Load (kips)	Reading	Load (kips)	Reading	PISTON		CALIPER		TELLTALES (in.)				STRAIN GAGES ($\mu\epsilon$)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
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11/24/64
10:19
10:26
10:28
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Remarks

ROCK ANCHOR LOAD TEST
ANCHOR NO. RD-2

P. 10 of 12

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Remarks

PHASE IV REPORT

VOLUME VA

**RESULTS AND INTERPRETATION OF
ROCK ANCHOR TEST PROGRAM**

APPENDIX B

DRILLING PRODUCTION LOGS

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Page B-2 through Page B-13	Drill Hole RD-1
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B-1

ROCK ANCHOR TEST
DRILLING PRODUCTION LOG
ANCHOR RP-1

<u>DATE</u>	<u>DESCRIPTION OF ACTIVITY</u>	<u>COMPLETED DEPTH ft</u>
27 Nov	start drilling first section of casing; hammer plugs at 40 ft; pull hammer and casing for repair	0
28 Nov	restart drilling; complete third section on day shift and fifth section on night shift; weld sixth section	120
29 Nov	continue drilling; complete eighth section seating casing 3 ft into rock; pull ODEX tools from hole	182
30 Nov	insert rock bit; cut 5-in.-dia socket into rock for 15 ft plus 3 ft extra for reference telltale; rate of drilling rock averaged 0.1 ft/min	200
1 Dec	install anchor tendon and grout; start to pull casing	
2 Dec	complete pulling casing; move drill rig to next hole	

Note: The above drilling production sequence was taken from
Daily Field Reports. The field log forms were not used
for this anchor hole

①

Supervisors 1
Operators 1 Operator: 2
Laborers 3

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
0	7:00 10:00					▲ Crew stood by for casing shoe to be checked by X-Ray. (see shift report)
19'6"	10:00 11:00	gray clayey silt	Gage not working.	Down the hole COEX bit w/ reamer + hammer.	0.2 cu/min	▲ This 19'6" was through 50' ft predrilled hole.
19'6"	11:30 17:30					▲ Setting up the 2 nd section on rig. Borewing + welding on progress.
						productive time 7 1/2 hrs
						100...

ROCK ANCHOR TEST LOG

Anchor No. RD-1 Batter 45° Supervisors 1
 Date 11/12/79 G.S. Elev 420.6 ± Operators J. J. Vetter & Matt R. J. J.
 Observer E. Iselle Weather SHOWING 0°F Laborers 3

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
19'6" TIP END	day Shift			Down The Hole open bit with flamer and Hammer		on 11/10/79 Pre drilled to 50 ft between casing and casing. I left site 0400 hrs. They were still setting HP Rig down
44'6" TIP END	1945 hrs	Gray To brown fine to med sand w/ trace silt.	gauge not working	11	1945 hrs To 2020 hrs	Went Very good. Reeling To end casing in ground at 2330 hrs. Start Setting 3rd Sec for welding at 0010 hrs. complete welding and grouting at 0400 hrs.
29'6" TIP END	0508 hrs	Gray To brown fine to med sand w/ trace silt.	gauge not working	11	0505 hrs To 0523 hrs.	3rd Sec went down easy air Pressure gauge not working rigor air Pressure approx 100-120 psi
					0.7 ft/min	productive time 10 hrs
					1.4 ft/min	

ROCK ANCHOR TEST LOG

Anchor No. RD-1 Batter 45° Supervisors _____
 Date 11/21/79 G.S. Elev ± Operators _____
 Observer D.T. ISO Weather _____
 Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
76" ^{76"} 69'6" ^{5'}	7:00 11:40	/	/	/	/	7:00 ~ 11:40 Welding and grinding the 4th section of casing.
87'6" ^{5'}	11:50 12:30	/	/	/	/	Lunch break.
69'6" ^{5'}	12:30 14:00	/	/	/	(-1 1/2 hrs)	Crew stood by for the welding to be checked by X-Ray. X-Ray showed the welding is OK but lacking of penetration due to the insufficient gap.
76" ^{76"} 94'6" ^{5'}	14:00 14:45	gray fine to coarse sand graded w/ fine gravel. trace lignite. med. gravel.	170 psi	/	0.3 ft/min	Drilling started at 14:15 and completed at 14:45.
" ^{5'}	14:45 15:10	/	/	/	/	To disconnect the discharge hose from the crane so that it could work for DP test.
" ^{5'}	15:10 17:30	/	/	/	/	Crane broke down at DP test area due to a worn-out pulley. The pulley was replaced at 17:20. So no work was done between 15:10 to 17:30 (Crane is needed to set up the DP test).
					(-2 1/2 hrs)	production time 6 hrs

ROCK ANCHOR TEST LOG

Anchor No. RD-1 Batter 45° Supervisors 1
 Date 1/12/13/79 G.S. Elev 422.6 ± Operators 1 + 1 labor 2 workers
 Observer L. I. Sells Weather cloudy + Rain 30° to 40° Laborers 3

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
94' 8" T.P. End	1900 hrs	Gray fine to coarse sand graded w/ fine gravel, trace lignite w/ trace silt.			14:15 day to shift 14:45	1445 hrs To 1900 hrs engine used 0.90 hrs 1900 hrs setting in for 5 min sec believe welding grinding finish at 2300 hrs weld looks Real good.
119' 9" T.P. End	0102 hrs	Gray fine to coarse sand w/ fine to med lignite. Trace silt.	approx 120	ODEX fit and reamer	0102 hrs to 0130 hrs	Went down easy. 1900 hrs. 1900 hrs To come off at 1900 hrs. 1900 hrs Very heavy water retain them discharge time to depth of 112' 5" fine gravel to approx 130' 15" Then to time to med sand to 141' 9" Then lignite pebbles to 144' 9" Very hard Pulling for last 3" Water return midline at this point.
144' 9" T.P. End	0510 hrs	Gray fine gravel to fine med sand to lignite pebbles - discrete.	approx 120	11	0510 hrs to 0615 hrs	productive time 10 hrs
					0.9 ft/min	
					0.4 ft/min	

ROCK ANCHOR TEST LOG

Anchor No. RD-1 Batter 45° Supervisors _____
 Date 1/13/79 G.S. Elev ± 422.6 Operators _____
 Observer D.T. Tso Weather SNOWING Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
144'9"	7:00 11:50					▲ 7:00-11:50 Welding + grinding the 7th section.
	11:50 12:30					▲ Lunch break.
	12:30 13:00					▲ To get ready for drilling.
	13:00 13:25					▲ Blowing the line.
144'9" 167'11"	13:25 14:00	Gray med. to coarse SAND, trace fine gravel , lignite.	120	COEX bit + reamer	0.7 ft/min	▲ To drill the 7th section
	14:00 17:25					▲ To set up the 8th section ▲ Welding and grinding finished at 17:00
167'11" 184'7"	17:25 18:00	Gray fine to coarse SAND graded w/ fine gravel, trace lignite	120	"	0.5 ft/min (1.1 ft 4" into rock)	▲ Bottom of the hole is at 184'7" ▲ Casing was set into bedrock for w.d.
		Limestone bedrock at 180'7"				productive time 11 hrs

7'1"
stick
up

Rock Anchor Test Log

RD-1

shiftwork performedremarks

13/14 Jan

pull drillrods
1930 to 2345productive time
4.25 hrs

14 Jan

Sunday

15 Jan

no work at site

ROCK ANCHOR TEST LOG

Anchor No. RD-1 Batter 45° Supervisors _____
 Date 1/16/79 G.S. Elev ± 422.6 Operators _____
 Observer R.L. MOBERLY Weather Cold; PL. Cloudy Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
184' 7"	7:00 9:20					REMOVING LAST 2 SECTIONS OF DRILL ROD.
184' 7"	9:20 11:00					CHANGE BITS; SWITCHED TO 6" DIA
184' 7"	11:00 11:40					LOWER DRILL TOOK INTO HOLE. ± 135' IN HOLE
184' 7"	11:40 12:40					LUNCH
184' 7"	12:40 1:45					LOWER LEANED OVER SIDE OF HOLE. SET UP TO START ROCK TEST
184' 7"	1:50 1:35	Limestone - may BE WEATHERED BETWEEN 178' & 202'	200 psi	6" DIA. CROSS BIT	45 min/18' 0.4"/min	DRILL ROCK. SEPARATE 18' 2" FROM BOTTOM OF HOLE (184' 7") DRILL ROD HAD BEEN FROM 178' TO 202'
184' 7"	2:35 3:00					FLUSH HOLE - CLEAN OUT RAN FOR 10 MIN
184' 7"	3:00 3:15	Bottom of Hole - 202.6'			productive time 11 hrs	EXTRACT RODS & BIT CLEAN UP AND RETURN OF LOG: 11:20

ROCK ANCHOR TEST LOG

Anchor No. ED-1 Batter _____ Supervisors _____
Date 12/7-79 G.S. Elev _____ Operators _____
Observer none Weather _____

[illegible]

ROCK ANCHOR TEST LOG

Anchor No. 1 PD-1
 Date 1-17-79
 Observer R.L. Morgan
 Batter _____
 G.S. Elev _____
 Weather _____
 Supervisors _____
 Operators _____
 Laborers _____

[illegible]

ROCK ANCHOR TEST LOG

Anchor No. 120-1 Batter Supervisors
 Date 1-18-79 G.S. Elev Operators
 Observer R. L. mo 529-4 Weather Laborers

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
	7:00					Preparation for inspection of primary growth.
	11:30					
	11:30					Lunch
	12:15					
	12:15					Preparation for pulling 1 st casing
	1:00					
	1:00					Pulled 1 st casing
	2:30					
	2:30					Start to remove 2 nd casing
	3:30					
	3:30					Pulled 2 nd casing
	4:30					
	4:30					Cut & began to remove 2 nd casing
	6:35					Left for sub casing production time 11 hrs
	6:35					

ROCK ANCHOR TEST LOG

Anchor No. RD-1 (Pulling)Batter 45°

Supervisors _____

Date 1/18 ~ 1/19/79G.S. Elev I 420.6

Operators _____

Observer D.T. TsoWeather Freezing Rain

Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
	19:55 1					7:55 Started to mix grout. Welder was welding hooks on the upper part.
	20:15 1					Tried to pump secondary grout into casing but failed. There might be some bent on grout hose and the trapped air was missing pump.
	20:25 1					
		2:3 hrs				
	20:25 1					Grout was injected into casing from the top. It took about 90 gals. of grout to fill the annular space between casing + sheath.
	22:15 1					
	22:15 1					No work was done.
	23:40 1					11:00 ~ 11:40 Lunch break.
	23:40 1					To pull up a 25' section with leave it on the head of the rig. A wire was hooked up at 1:20 due to the wire being overloaded.
	1:20 1	1.7 hrs				total time 4.0 hrs

ROCK ANCHOR TEST LOG

Anchor No. RD-1 (pulling casing) Batter 1/2
 Date 1-19-99 G.S. Elev 101.100m
 Observer E.L. Measey Weather 2
 Supervisors 1/2
 Operators 101.100m
 Laborers 2

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
	7:00					NO Activity due to ice on Equipment.
	9:30					Remove ice from Rig
	10:30					Remove 3rd casing
	11:35					LUNCH
	12:15					Preparation for pulling 4th casing & pullers
	2:30					SHOULDER Casing down w/ concrete pad
	3:50					BREAK DOWN RIG & MOVE TO NEW
	4:10					production time 5 hrs

ROCK ANCHOR TEST LOG

Anchor No. RD-2 Batter 45° Supervisors _____
 Date 1-17-79 G.S. Elev 422.6 Operators _____
 Observer R L MOBERLY Weather CLCUDY Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
0						
20.0	7:00 A	PREVIOUSLY DRILLED				THIS PORTION OF HOLE COMPLETED ON NIGHT SHIFT C/O WILL INSPECTION HOLE PASSED TO 50' S
20.0	7:45 A					SHIFT CHANGE FUEL RIG EQUIPMENT
20.0	7:45 A					REPAIR HYD. HOSES & AIR COUPLER
20.0	10:15 A					WELD 2" CASING PERIODIC DELAYS CAUSED BY LACK OF ENERGY DEPEND. NO INSTANTANEOUS FLOW-ARREST STAND BY - CRACKER FOR ENERGY PICKER
20.0	4:00 P					
20.0	4:00 P					
20.0	5:30 P		120- 250	DRY AIR 168 mm.	20 ¹ / ₂ min 1.75 ft/min	DEVELOP 2" CASING
45.0	5:50					
45.0	5:30					STAND-BY - CRACKER FOR ENERGY PICKER. COMMENT WAS AIR HOSE WAS INSPECTION CRACKER PICKER

Anchor No. 20-2
 Date 1-17-18-79
 Observer J. Kest
 Batter 45°
 G.S. Elev ± 420.6
 Weather Clear, deep cold
 Supervisors 1
 Operators 1. Gilbert, Walter 2-
 Laborers 3. name operator 1
2 Carpenter 2

[illegible]

ROCK ANCHOR TEST LOG

Anchor No. RD-2 Batter 75° Supervisors _____
 Date 1-18-79 G.S. Elev 420.6 ± Operators _____
 Observer R.L. Weather 1424 - Cloud 15° ± Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
70.0'	7:00 1 8:00					SHIRT CHANGES - RIGID EQUIPMENT & PREPARE 4TH PIECE OF CASING
70.0'	8:00 1 12:00 ±					Set & weld 4TH CASING
70.0'	12:00 ± 1 12:45 ±					Lunch
70.0'	12:45 ± 1 3:00 P					weld 4TH CASING
70.0'	3:00 1 3:30					RIG STAND BY FOR X-RAY of 4TH WELD
70'	3:30 1 5:20					CARD NOT FOR CALCULATION (SEE DAILY LOG)
70'	5:20 1 6:00					CUTTING 4TH CASING OFF BUT POPS COULD NOT BE REMOVED STARTED REMOVING REMAINING CASING
	6:00 1 6:55					PULL 3RD CASING 6:55 1014 P.M. END DAILY LOGGING

ROCK ANCHOR TEST LOG

Anchor No. RD-2 Batter 45° Supervisors _____
 Date 1/18 ~ 1/19/79 G.S. Elev I 420.6 Operators _____
 Observer D.T. Iso Weather Freezing Rain Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
	7:00 7:40					@ 7:40 3rd casing was pulled out and cut from 2nd section ~ 8:00 Freezing rain started
	7:40 8:30					@ 8:30 2nd section was pulled out and cut from 1st section.
	8:30 9:25					@ 9:25 1st section was pulled out.
	9:25 11:00					@ 9:25 ~ 10:10 To take bit + hammer from drilling rod. Fine to med. sand, trace fine gravel jammed up between 1st + casing. @ 10:10 ~ 11:00 To separate hammer from bit. same material jammed between. they were then cleaned up @ Lunch break.
	11:00 11:40 7:00					@ No work was done because of the hazardous working condition. (slippery everywhere).

ROCK ANCHOR TEST LOG

Anchor No. R.D-2 Supervisors 1/2
 Date 1-19-79 Operators 1
 Observer R. Moberg Laborers 3
 Batter _____
 G.S. Elev _____
 Weather _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
0	7:00 A					Down, due to ice on Equip
	8:00					Bit & casing out of hole & cleaned on night shift
	8:30					Removing ice from RIG
	9:30					Attempted to get Hammer working - pressure blown w/ sand. Not satisfactory cleaned PULVER NIGHT SHIFT
	11:35 A					Lunch
	12:15 P.					CLEANING HAMMER & CASING
	12:15					
	4:00					
0	4:00 P	Open Hole	0	ODex 165 mm	10 min 2.0 ft/min	Started 1st casing into hole casing length 27.0'.
20'	4:10					Preparation of 2nd casing for welding
20'	4:10					
20'	6:35					Left R.I.A. For Shift Change
20'	6:35					

ROCK ANCHOR TEST LOG

Anchor No. RD-2 Batter 45° Supervisors 1
 Date 1/19 ~ 1/20/79 G.S. Elev Operators 1 Dier: 1
 Observer D. T. Tso Weather Laborers 6 Welder: 2

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
	19:00 5					▲ SHIFT CHANGE.
	19:30					▲ Welding and grinding of 2nd section ▲ Preparation for drilling.
20' to 54' 6"	22:35	Grey fine to med. SAND. trace coarse sand		ODEX 145 bit.	30 min 1.15 ft/min in pre-drilled sand	▲ Advancing the casing from 20' to 54' 6" ▲ Casing was driven in by hammer very easily. Not much of cuttings came out but blow was good. ▲ Lunch break.
	23:05 5		0			▲ Loading the 3rd section of casing ▲ Preparation for welding.
	23:45 5					▲ Welding + grinding of the 3rd section.
	1:10					▲ Lunch break.
	3:00 5					
	3:40					

ROCK ANCHOR TEST LOG

Anchor No. RD-2.

Batter _____

Supervisors _____

Date 1/19 ~ 1/20/79

G.S. Elev _____

Operators _____

Observer D.T. TSO

Weather _____

Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
54.5' to bottom of bit	3:40 5 4:08					▲ Preparation for drilling.
75.5'	4:08 5 4:37	Gray med. to coarse sand, trace fine gravel, lignite.	Gage was broken	ODEX 165 bit	29 min 0.6 ft/min in fluid-filled sand	▲ Drilling the 3rd section. ▲ Blow as good Normal amount of cuttings. ▲ Loading 4th section of the casing onto the rig and setting up.
"	4:37 5 6:05					▲ Welded line up the casing and point welded it.
"	6:05 5 6:35					

ROCK ANCHOR ST LOG

Anchor No. RD-2 Supervisors 'BRYAN
 Date 1-20-79 Operators _____
 Observer R. L. MORGENTHAU Laborers _____
 Batter 45°
 G.S. Elev 420
 Weather HAZY 35°

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
70.5'	7:00 A 9:45			004 165		WELDING 4TH CASING
	9:45 10:15	(- 1/2 hr)				Waiting for welding shoes to be moved
70.5' 95.0	10:15 11:00 ±				45 min 0.5 ft/min	Drill 4th section of casing
	11:00 11:45					Preparation of 5th casing
	11:45 12:30 P					LUNCH
	12:30 3:35					Welding 5th casing
	3:35 4:00	(- 1/2 hr)				Waiting to move shoe
	4:00 4:15		250		15 min see next pg.	Drill 5th casing (only 1')

B-21

ROCK ANCHOR TEST LOG

Anchor No. RD-2 Supervisors _____
 Date 1-20-79 Operators _____
 Observer RL Moberly Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
	4:15					
	4:55	(-0.7hr)				GRACE DISMAYE PARTT WND MOVES STAY. CARP. WND
to 119' 7"	4:55 5:10	GRACE FWC TO M100 SAND UP ARE GRACE	250	0001 165	15 min (188/min) total 30 min for 24.8 ft 0.8 ft/min	DRILL 5th CASING (last 10') ROTATION 26 RPM
	5:10 6:00					PREPARE 6th CASING
	6:00 6:35					PARALLEL WELD 6th CASING
	6:35					LEFT RIL WEE SMOET BRIDGE

ROCK ANCHOR TEST LOG

Anchor No. RO-2Batter 45°

Supervisors _____

Date 1/20 ~ 1/21/79

G.S. Elev _____

Operators _____

Observer D.T. TSO

Weather _____

Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
	19:00 5					SHIFT CHANGE.
	19:30 5					WELDING & GRINDING THE 8TH SECTION OF CASING.
	20:40 5					WAITING FOR CARPENTERS TO MOVE AWAY THE SHED USED IN WELDING
	21:05 5	(- 1/2 hr)				
119.6 144.5	21:05 5 22:45	GREY FINE TO COARSE SAND GRADED WITH FINE GRAVEL, TRACE MED. GRAVEL, LIGNITE.		ODEN 125 BIT	40 min (1 hr less due to equip phn)	DRILLING THE 8TH SECTION. THE FLUSHING HEAD WAS BLOWN OFF DURING DRILLING. LABORERS SPENT HALF HOUR TO PUT IT BACK. IT WAS HARD TO HOLD IT ON POSITION. THE OPERATOR HAD THE WELDER TO WELD A HOOK ON THE RC. BLOCK SO THAT THE HEAD COULD BE TIED TO THE HOOK W/O BEING BLOWN OFF DURING DRILLING. THE WELDING SPENT ANOTHER HALF HOUR

ROCK ANCHOR TEST LOG

Anchor No. RD-2 Supervisors _____
 Date 1-20-21-79 Operators _____
 Observer D.T. Tso Laborers _____
 Batter _____
 G.S. Elev _____
 Weather _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
144.5	22:55 23:35					▲ LUNCH BREAK. ▲ DURING BREAK, THE RIG KEPT THE BLOWING. AT ABOUT 23:30, THE FLUSHED OUT MATERIAL CHANGED TO MED. TO COARSE SAND, GRADED WITH FINE TO MED. GRAVEL, TRACE LIGNITE.
	23:35 3:00					▲ LOADED THE 7TH SECTION OF CASING TO THE RIG. ▲ WELDED + GRINDED THE 7TH SECTION
	3:00 3:40					▲ LUNCH BREAK.
144.5 to 169.5'	3:40 6:10 6:20				150 min 0.2 ft/min	▲ DRILLED THE 7TH SECTION INTO GROUND ▲ LABORERS TOOK HEAD FROM THE LAST PIECE OF CASING SO THAT A HOSE COULD BE INSERTED IN TO INFILL WATER.

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ROCK ANCHOR TEST LOG

Anchor No. RD-2 Batter _____ Supervisors _____
 Date 7-22-79 G.S. Elev _____ Operators _____
 Observer R.L. McGee Weather Clear - becoming overcast Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
170'	7:00 8:00					SHIFT CHANGE, FUEL, WATER UP EQUIPMENT etc.
	8:00 9:00					FINISHING HOLE - REPAIR OF CASING
	9:00 11:45					SETTING WELDING BEADING
	11:45 12:30					LUNCH
	12:30 1:00					SETTING UP TO START DRILLING
170'	1:00	MED TO COARSE SAND & GRAVEL	250 ±	DOZ 165		
175'	1:02 ±					Top of Rock = 175'
175'	1:06 ±		"	"	2 13 min 8'	
178'	1:13	Limestone			16 min	
178'	1:15 6:00					CUT OFF EXCESSIVE CASING & REMOVE DRILL RODS & PUT 6" ROCK BIT ON FOOT

Anchor No. RD-2
Date 1-22-79
Observer B.L. MOISEWITZ

Batter _____	Supervisors _____
G.S. Elev _____	Operators _____
Weather _____	Laborers _____

[illegible]

ROCK ANCHOR TEST LOG

Anchor No. RD-2 Supervisors _____
 Date 1/22-1/23/79 Operators 1, 2, 3
 Observer D.T. Ro Weather 3

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
170'	19:00 21:07					Adding rods to lower down bit to the bottom of the hole.
	21:07 23:57				(-1 hr)	Preparation for drilling. 21:17-22:12 Cherry picker was not available, crew stood by. 23:00-23:40 Lunch break.
191' 9" A.M.	23:57 0:27	Limestone				Drilling the rock socket. 0-1 ft 23:57 ~ 0:00. 1-1.9 ft 0:00 ~ 0:02 1.9-3.05 ft 0:02 ~ 0:03 3.05-4.05 ft 0:03 ~ 0:04 4.05-5.05 ft 0:04 ~ 0:06 5.05-6.05 ft 0:06 ~ 0:08 6.05-7.05 ft 0:11 ~ 0:13 7.05-8.05 ft 0:13 ~ 0:15 8.05-9.05 ft 0:15 ~ 0:17 9.05-10.05 ft 0:17 ~ 0:19 10.05-11.05 ft 0:19 ~ 0:20.5 11.05-12.05 ft 0:20.5 ~ 0:22.5 12.05-13.05 ft 0:22.5 ~ 0:24.5 13.05-13.9 ft 0:24.5 ~ 0:26.5

Anchor No. RD-2
 Date 1/22-1/23/79
 Observer D.T. Ro
 Batter _____
 G.S. Elev _____
 Weather _____
 Supervisors _____
 Operators 1, OLS
 Laborers 3

[illegible]

B-28

ROCK ANCHOR TEST LOG

Anchor No. 10-2 Batter _____ Supervisors _____
 Date 1-23-79 G.S. Elev _____ Operators _____
 Observer R. Moberly Weather RAIN CHANGING TO SNOW Laborers _____
30° ±

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
19' 9"	7:00 A. ' 9:00					SHIFT CHANGE - FUEL & SETTING UP ON HOLE OIL FLOODING ON TOP OF WATER ON ANCHOR. WASTED TO RE- FLUSH HOLE & SOCKET CONCRETE INTO HOLE
	9:00 ' 11:35					LUNCH
	12:25 ' 12:30					SETTING ROSS & PROPHANE TO PHASE
	1:30 ' 2:20					FLUSHING HOLE - CONSIDERABLY BLACK DRILL OR HYDRAULIC OIL CAME OUT FOR 15' 5 MIN. 45 MIN OF FLUSHING REQUIRED TO CLEAR DRILL
	2:20 ' 3:15					PULLING ROSS
	3:16 ' 6:35					STAND-BY.

ROCK ANCHOR TEST LOG

Anchor No. R0-2 Batter _____ Supervisors _____
 Date 2-1-25-79 G.S. Elev _____ Operators _____
 Observer R.L. MOORE Weather 10° AM 25° PM Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
19'9"	7:00 A 11:35					Rig broke down. Leave on Relief Valve.
	11:35 12:45					Lunch
	12:45 1:30					Repairs
	1:30 6:30					Rig moved off site STAND-O-BY

ROCK ANCHOR TEST LOG

Anchor No. RD-2 Supervisors _____
 Date 1-26-79 Operators _____
 Observer C.L. MONTGOMERY Laborers _____
 Batter _____
 G.S. Elev _____
 Weather _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
19' 9"	7:00 8:30	(- 1 1/2 hrs)				STAND BY
	8:30 11:35					INSTALLING ANCHOR
	11:35 12:35	5.75 hrs				LUNCH
	12:35 3:15					INSTALLING ANCHOR
	3:15 5:30					SET PLUG BACK OVER HOLE - SET UP GRout PLANT
	5:30 6:00					FLUSH TUBING - 250 GAL WATER PUMPED
	6:00 6:20					GRouting STOP
	6:20 6:25					REPAIR FUEL FILTER

ROCK ANCHOR TEST LOG

Anchor No. _____

Date _____

Observer _____

Batter _____

G.S. Elev _____

Weather _____

Supervisors _____

Operators _____

Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
19' 8"	6:26' ' 6:35					Clean dirt - bottom clean tank Before water came out top of casing Δ 60-70 gal.
	6:35 ' 6:50					Mud prepared Bld for padding casing
	6:50					Shift concrete

2nd SHIFT

ROCK ANCHOR TEST LOG

Anchor No. R0-2 Batter 45° Supervisors /
 Date 1/26-1/27/79 G.S. Elev Operators L. Miller: 1. Welder: 2
 Observer D.T. Iso Weather SNOW Laborers 3

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
	19:00 ;					▲ First section of casing was pulled up and cut.
	21:45 ;					▲ One tendon seemed to be ripped off.
	21:45 ;					▲ Welded hooks to the casing.
	22:55 ;					▲ Extracted casing 2nd section of casing of the hole. (2.45')
	22:55 ;					▲ Lunch break.
	23:40 ;					▲ Weld Cut the 2nd section.
	23:40 ;					▲ Welded hooks on 3rd section.
	2:25 ;					▲ Extracted 3rd section. (2.33').
						▲ Half hour was spent to shift grinding saw to compressed air powered saw. Some oil + water from the compressor of the rig stopped the saw. Welders changed back to grinding saw.
	2:25 ;					▲ Cut the 3rd section
	2:55 ;					

ROCK ANCHOR TEST LOG

Anchor No. RD-2 Batter Supervisors
 Date 1/26-1/27/79 G.S. Elev Operators
 Observer D.T. Tso Weather Laborers

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
	3:00 3:40					▲ Coffee break.
	3:40 4:15					▲ Welded hooks to the 4th section. ▲ Extracted 4th section. (24.8')
	4:15 6:35					▲ Cut the 4th section. ▲ Welded 5th section hooks to 5th section. ▲ Extracted 5th section.
						▲ Partially cut 5th section w/ torch. ▲ Crew knocked off at 6:35.

U

Observer L. Mossey

7:00 A	7:30
7:30	9:35

B-36

1st shift

LOCKS AND DAM NO. 26
GENERAL TESTING PROGRAM
DAILY REPORT

DATE: 12/28/78

REPORT PREPARED BY: D.T. Tso

SUMMARY OF ACTIVITIES: Rock Anchor Test - Drilling Effects RA-I
Odex 115

7:00 ~ 8:40 Advanced casing to 56' (including
2 ft in shoe).

8:40 ~ 10:45 WCC took ground instruments
measurement. Crew + rig standing by.

10:45 ~ 11:05 Drilling operation resumed.

11:05 ~ 11:45 WCC took G.I. measurement. Crew
+ rig standing by.

11:45 ~ 12:30 Lunch break.

12:30 ~ 13:00 Casing broke at 13:00

13:00 ~ 18:05 Pulling out of the casing on progress.

5 1/2 hrs production

SIGNED: David Tso

SHIFT #2

LOCKS AND DAM NO. 26
GENERAL TESTING PROGRAM
DAILY REPORT

1 of 2

DATE: 12-28-78
29REPORT PREPARED BY: L IsetteSUMMARY OF ACTIVITIES: Drilling Effects Test - RA-II1900 hr - 2130 hr casing out of RA-II ---2130 hr - 2200 hr - break2200 hr - 2400 hr They had to cut casing to
Release from Bit. measurements of Bit. guide 4.9252400 - 0030 hr - Lunch breakI made measurements of male end of casing
but will have to be measured with different set
of calipers. Readings on the one I did were

AB = 5.506

CD = 5.507

EF = 5.506

} ave 5.5 in.

0030 hr - 0130 hr made measurements of Bit guide
and they Reassembled.0130 hr - 0300 hr Reset First sec in RA-II and set
up second sec.0300 hr - 0330 hr. Break

SIGNED:

L Isette

SHIFT #2

LOCKS AND DAM NO. 26
GENERAL TESTING PROGRAM
DAILY REPORT

2 of 2

DATE: 12-28/78REPORT PREPARED BY: L. Jett

SUMMARY OF ACTIVITIES:

03.30 hr. - 04.30 hr. when inserting 2nd sec at approx depth of 33 FT. Heave point next to slab started to bubble around it and water started flowing out. also North-West side of slab bubbling up in 2 spots approx 2 FT apart. Just at edge of slab, 1st sec going down did not show no fine sand second sec started showing some fine sand at approx 3.5 FT.

04.30 - 06.00 hr. Trying To figure way To Haul casing. nothing done.

06.00 hr. - 06.30 hr. slid rail in casing and sat on rig. for 3rd sec. still has to be put to gether

06.30 - 07.00 hr. stop because it started raining quit raining 8 min later.

2 1/2 hrs production

SIGNED:

L. Jett

LOCKS AND DAM NO. 26
GENERAL TESTING PROGRAM
DAILY REPORT

1 of 2

DATE: 12-29/30-78REPORT PREPARED BY: L. Iselt

SUMMARY OF ACTIVITIES: Rock Anchor Test RA-I-1
1900hr - 1930hr advanced hole ^{90ft} to 100 ft by
pushing and rotating casing and rods. at
1930hr, Rick-ICOS said that they were at a
100 FT and was waiting for a test to be done
we finished instrumentation at 2100 hr. Foreman
Rick-ICOS was having steel welded to casing
to see if they could free rods up finished
at 2215hr. it advanced approx 2 feet and
lodged up again. and started plugging bad.
hammer had started working when it was
advancing that 2 ft, after removing steel
from casing. start advancing hole hammer
started working and then something lodged
and plug up again. at 2345 hr. Foreman had
welder, weld some more steel to casing and
tried to break rods loose from casing at
this time it bent steel and broke weld when
continuing. it would move approx 1" in bot.
directions then lodge. The Foreman Rick
from ICOS stated that he was going to
repeat this. that he was not pulling no
rods, start welding more steel on casing

SIGNED: L. Iselt

see page 2

B-40

LOCKS AND DAM NO. 26
GENERAL TESTING PROGRAM
DAILY REPORT

2 of 2

DATE: 12-29/30-78REPORT PREPARED BY: L. Iselt

SUMMARY OF ACTIVITIES: ROCK ANCHOR TEST RA I-1
AT 0015 hr. Finished AT 0100 hr. rotating
back and forth with approx 35,000 Pounds Torque on
Rods and casing. Foreman had operators keep
this up for approx 45 minutes. gage may not be com-
pletely accurate. appearance of stress on Rods
and casing shows a lot of bending action
visually when pressure is being applied.
Stopped at 0145 hr for brake. returned from
brake at 0215 hr. Foreman Rick Foricos at 0215 hr
had iron being cut off casing to pull Rods and
casing. started pulling Rods and casing at -
0245 hr. First sec removed by 0530 hr. ²⁴ sec.
Rock From 1605 stated They were having lunch
tonight from 0330 hr to 0400 hr. 2nd sec pulled
and was working on cutting it still have some
to go STOP 0645 hr = 30 ^{FT} sec.

(2 hrs)

[Note: Work at RA-I1 stopped at this point
until 19 Jan 79] R7

SIGNED: L. Iselt

Anchor No. RA I-1 Batter _____ Supervisors _____
 Date 1/19-1/20/79 G.S. Elev _____ Operators _____
 Observer D. T. ISO Weather _____ Laborers _____

[illegible]

ROCK ANCHOR TEST LOG

Anchor No. LA-I-1 Batter 45° Supervisors Mr. Brown
 Date 1-20-79 G.S. Elev 1000 Operators 1 1/2 Men & 1 Horse
 Observer C.L. MAGBELL Weather 42-71 35° Laborers 2

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
0	7:00 A					ALLEN RIG ON SITE
	9:30					WAITING FOR WOOD SHEET FOR DRILLER
	9:30					CLEANING RIG / WAITING FOR SHEET
	10:00					
	10:00					
	11:45					LUNCH
	11:45					WAITING FOR SHEET
	12:30 P					INSTALLATION OF WOOD SHEET
	12:30					CARPENTERS WORKING
	2:15					WAITING FOR SHEET
	2:30					CARPENTERS COMPLETED (ALMOST) SHEET
	4:00					
	4:20					
	4:45					

ROCK ANCHOR TEST LOG

Anchor No. RA-11 Batter _____ Supervisors _____
 Date 1-20-79 G.S. Elev _____ Operators _____
 Observer E. H. B. B. B. Weather _____ Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
	4:45					Waiting (?)
0	5:15			7 1/2" TR- cone Lopes Bit		Started Reaming (Pre- Drilling Hole)
1'	5:10					TRIED TO BREAK OFF BIT DIDNT COME
50	6:10					LEER RIL FOR SNEY CHANGE
	6:35					4 hrs production
	6:35					

ROCK ANCHOR TEST LOG

Anchor No. BA-11
 Date 1-20-79
 Observer DT Tso
 Batter _____
 G.S. Elev _____
 Weather _____
 Supervisors _____
 Operators _____
 Laborers _____

[illegible]

ROCK ANCHOR TEST LOG

Anchor No. PA-11 Supervisors _____
 Date 1-22-79 G.S. Elev _____
 Observer R.L. NOBSELT Weather _____
 Operators _____
 Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
14' 9"	7:00 8:00					SHIFT CHANGE, FUEL, WARM UP EQUIP.
	8:00 10:30					WAITING FOR NEW WELDING EQUIP - OLD ONE WOULD NOT WORK
	10:30 11:45					SETTING 2nd CASING & WELDING
	11:45 12:30					LUNCH
	12:30 2:00					WELDING 2nd CASING
	2:00 2:15					GETTING READY TO DRILL
14' 9"	2:15	NO CATHODE PRE-DRILLING 14' 6"	150 psi	OVER 115	20' / 12 min 1.7 ft/min	DRILL 2nd CASING
34' 9"	2:27					PREPARING 3rd CASING SETTING & WELDING
34' 9"	2:27 4:40					

B45

ROCK ANCHOR TEST LOG

Anchor No. BA11 Supervisors _____
 Date 1-22-77 Operators _____
 Observer E.L. McGee Laborers _____
 Batter _____
 G.S. Elev _____
 Weather _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
34' 9"	4:40					Setback up to small 3" casing
34' 9"	4:46					
34' 9"	4:46	no casing	150-	ODER	19' 9" / 8 min	Drill 3" casing
54' 6"	4:54	pre-cast concrete	150	113	2.5' min	PREPARING AT CASING LINE UP
54' 6"	4:54					
54' 6"	6:35					LEFT FOR SHIFT CHANGE
54' 6"	6:35 (18:35)					
						8 1/2 hrs prod

AD-A076 098

WOODWARD-CLYDE CONSULTANTS CHICAGO IL F/G 13/2
RESULTS AND INTERPRETATION OF ROCK ANCHOR TEST PROGRAM. EXISTIN--ETC(U)
JUL 79 J PEREZ , R A FASANO DACW43-78-C-0005

F/G 13/2

DACW43-78-C-0005

NL

UNCLASSIFIED

2 OF 3

AD
A076098

Table 1. Continued



ROCK ANCHOR TEST LOG

Anchor No. RA-I-1 Supervisors _____
 Date 1/22 ~ 1/23/79 Operators L. Oiler: 1 Welder: 2
 Observer D.T. ISO Laborers 3
 Batter _____
 G.S. Elev _____
 Weather _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
54'-6"	19:00 20:12					Welding & grinding the 4th section of casing.
66'-7"	20:12 21:17	Gray fine sand.		ODEX 115	35 min 12.1 ft 0.3 ft/min	Preparation for drilling. Drilling started @ 20:42 finished @ 21:17 Hammer was not activated to strike. Very few cuttings came out.
	21:17 22:08					Loading the 5th section and lined up for welding.
	22:08 23:00					Welding & grinding the 5th section.
	23:00 23:40					Lunch break.
94'-4"	23:40 0:22	Gray fine sand.		ODEX 115	42 min 27.7 ft 0.7 ft/min	Preparation for drilling. Drilled the 5th section into ground. No hammer driving. Very few cuttings.

ROCK ANCHOR TEST LOG

Anchor No. RAI1 Supervisors _____
 Date 1/22-1/23 Operators _____
 Observer D.T. [unclear] Laborers _____
 Batter _____
 G.S. Elev _____
 Weather _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
	0:22 5					▲ Loaded 6th section and lined up for welding.
	1:47 5					▲ Welding + grinding the 6th section.
	3:00 5					▲ Coffee break.
	3:40 5					▲ Preparation for drilling.
4:30						
4:30 1/4'	4:30 5	Grey fine sand.		ODEX 115	70 min 19.7 ft 0.3 ft/min	▲ Drilled the 6th section into ground ▲ Operation was stopped off and on to tighten the loose connection between flushing head + casing. ▲ To disconnect the rod and head so that 7th section can be loaded on. Much difficulty was encountered because another connection on the head got disconnected first. always
5:40 5	5:40 5					
6:30	6:30					

11 hrs.

ROCK ANCHOR TEST LOG

Anchor No. RA-I1
 Date 1-23-79
 Observer R.L. Moberly

Batter _____ Supervisors _____
 G.S. Elev _____ Operators _____
 Weather RAIN CHANGING TO SNOW Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
114'	7:00 A 1 7:20					SHIFT CHANGE, PUBL ETC
	7:30 1 11:00					WELDING 7TH CASING GROUND INSTRUMENTATION TAKEN DURING THIS PERIOD
	11:00 1 11:35					DOWN DUE TO RAIN
	11:35 1 12:25					LUNCH
	12:25 1 1:00					GO HOME READY TO DRILL
129 ±	1:09 1 1:18		175	DOUG- 115	9 min 1.7 ft/min	DRILL 13' 15" OF 7TH CASING PREPARING 2.25" DIA COLLAR MACHINE COULD NOT FUNCTION
139" "	1:18 1 5:00				—	SHOVED, DRILLED OUT 7TH CASING TO DEPTH. & TRYING TO CHANGE CHANGE PRESS. INSIDE COLLAR
	5:00 1 6:40					GOING 2000 OUT OF HOLE
	6:40					LEFT FOR THE SUPER CHANGES

11 hrs

ROCK ANCHOR TEST LOG

Anchor No. RA-I1 Supervisors _____
 Date 1-25-79 Operators _____
 Observer R.L. MOBERLY Laborers _____
 Batter _____
 G.S. Elev _____
 Weather CA 10° AM
2:50 PM

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
133' 0"	7:00 A 8:15					Start & warm up
	8:15 11:35					Pulling Rods.
	11:35 12:45 P					Lunch
	12:45 2:45					Reaching off hammer & bit & install different hammer
	2:45 4:30					Going back in hole - about 20' of rods. ICS decided to switch bits
	4:30 5:00					Pull bit off hole after pulling up about rods
	5:00 6:35					Set ICS R/C on hole
					5 1/2 hrs	

2nd SHIFT.

ROCK ANCHOR TEST LOG

Anchor No. RA11 Batter Supervisors 1
 Date 1/25 - 1/26/79 G.S. Elev Operators L. Dier:1
 Observer D.T. Iso Weather Laborers 3 - Crane Operator:1

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
	19:00 5					Shift change.
	19:30 5					Loading rods + lowering the bit. It went down very smoothly.
rod @ 110'	23:00					Stopped at 110 ft for break.
	23:00 5					Lunch break.
	23:40 5					To change the fuel filter. Tried to fix up some trouble of the oil system (see shift report) but failed.
rod @ 115'	4:00					Rod stopped at ~115 ft and wouldn't go down any further. It looked like the rod bit on something.
	4:00 5					Stand by for further decision.
	7:00					Obs good.

ROCK ANCHOR TEST LOG

Anchor No. 12A-11 Batter _____ Supervisors _____
Date 1-26-79 G.S. Elev _____ Operators _____
Observer C. L. Moberly Weather _____ Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
13'0"	7:00 , 11:35					RIC ABOVE DRAIN. NO DELINE
	11:35 , 12:35					LUNCH
	12:35 , 6:45					RIC ABOVE DRAIN - NO Deline
						10

2nd SHEET

ROCK ANCHOR TEST LOG

P. 1 of 3.

Anchor No. RA11Batter 45°

Supervisors _____

Date 2/1 ~ 2/2

G.S. Elev _____

Operators 1. Over:1Observer D. T. TJOWeather ~13° FLaborers 3 Charney, J. J. operator:1

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
	19:00 1					▲ Shift change.
	19:30 1					▲ Moved shed, generator from DP lot area to RA test area.
	19:30 1					▲ Hooked up all the hoisters used for rig
	22:20 1					▲ Crew looked for all the tools necessary for operation.
	22:20 1					▲ Set up end table and prepared for pulling tools.
	23:00 1					▲ Pulled two sections of rod off the casing.
	23:00 1					▲ Lunch break.
	23:40 1					▲ Pulled the 3rd + 4th sections off.
	23:40 1					▲ Wrench used for disconnect rods "sweater" and the adjusting screw got frozen. Laborers brought in torch to thaw out the ice but it got frozen again right away. Crew could not break connection between 5th + 6th
	0:05 1					
	0:40 1					

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ROCK ANCHOR TEST LOG

Anchor No. RA-11

Date 2-12-77

Observer D.T. TSO

Batter _____

G.S. Elev _____

Weather _____

Supervisors _____

Operators _____

Laborers _____

P. 2 of 3

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
	0:40 1:00					▲ Crew broke for warm up.
	1:00 2:00					▲ Welder was called in to use the cutting torch to thaw the ice on wrench and heat up the female end of the connection.
						▲ 1:05-1:30 Cherry picker, screwed up its cable wrap. >5 min. in getting it straight.
						▲ Bit was out @ 2:00.
	2:00 3:00					▲ Disconnect ODEX bit and changed to an ordinary bit (about 10' away)
	3:00 3:40					▲ Coffee break.
	3:40 4:10					▲ Tested the hammer + bit. Air came out from the bit was little. Also the hammer was not working. 100% experienced bit thought that sand must have plugged inside of the hammer.
	4:10 5:40					▲ Hammer was brought into trailer and took part. Small amount of sand + ice was found inside. A cleaned up the site.

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p. 303

ROCK ANCHOR TEST LOG

Anchor No. RA-13 Batter Supervisors
 Date 2-12-77 G.S. Elev Operators
 Observer DYB Weather Laborers

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
	5:40 5 6:40					Put the parts back into the hammer Hammer & bit were connected to the rod and tested. Air-blown seemed OK

[Note: Drilling with ODEX 115 discontinued] R7

ROCK ANCHOR TEST LOG

Anchor No. 1RA-I1 Batter 45° Supervisors _____
 Date 2-6-79 G.S. Elev _____ Operators _____
 Observer R.L. Moberley Weather _____ Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
0	7:40	—	—	165mm 00ey		Set RIG BACK up on H04
	7:40					Set up? DRILL IN PREVIOUSLY ADVANCED HOLE
	11:45					END
	12:30				—	DRILL & WELD CASING IN PREVIOUSLY ADVANCED HOLE
70'±	6:45					11 hrs

ROCK ANCHOR TEST LOG

Anchor No. RA-11 Better Supervisors
 Date 2-7-79 G.S. Elev Operators
 Observer R.L. MOBERLY Weather Laborers

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
70'±	7:00 A			165 mm 0007		Start chugger start up etc
	7:30					welding 4th casing
	7:30					waiting for welding steel to be moved
	10:00					
	10:00					
	11:00					
to 95'±	11:00 11:15±				15 min 1.7 ft/min in predrilled ground	Drilling 4th casing (in previously advanced hole)
	11:15					Continue 5th casing
	11:45					lunch
	11:45					
	12:30					welding 5th casing
	12:30					
	5:45					
to 105'	6:45 6:00					Drilling 5th casing (in previously advanced hole)
	6:00 6:45			10 hrs		getting next casing prepared

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ROCK ANCHOR TEST LOG

Anchor No. RAI1 Batter _____ Supervisors _____
 Date 2/7 ~ 2/8/79 G.S. Elev _____ Operators _____
 Observer D.T. Iso Weather _____ Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
105'	19:15 ; 22:05					Welding & grinding the 6th section.
125'	22:05 ; 23:20	Grey fine to med. SAND.			75 min 20 ft 0.3 ft/min in pre-drilled sand	Preparation for drilling. 22:25 discharge head blew off. The laborers had to use hammer to keep on punching on top of the head so that it would follow the casing. It reduced the operation drastically.
125'	23:30 ; 0:10					Lunch break.
	0:10 ; 1:30					Some cracks found on top of the head caused by hammer punching. Welder filled these cracks and put another piece of steel to reinforce that area.
	1:50 ; 3:50					Loaded the 7th section. Welded & grinded the 7th section.
135'	3:50 ; 6:30					Preparation for drilling. Drilling started at 4:05. Head was blown off right away.

B, 500

ROCK ANCHOR TEST LOG

Anchor No. RAI-1 Batter Supervisors
 Date 2/3-2/6/37 G.S. Elev Operators
 Observer D T T30 Weather Laborers

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
135	3:50 5 6:30					▲ Crew spent about 20 mins to work on the head but failed. Then they decided to hold the handle w/ cable and hook the other end on a shackle. After that was done and drilling resumed, the shackle broke. (~ 6:10).
						▲ It was welded to fix it. Crew knocked off at 6:30.
						4 1/2 hrs

ROCK ANCHOR TEST LOG

Anchor No. 2A-11 Batter Supervisors
 Date 2-8-79 G.S. Elev Operators
 Observer R. McGehee Weather Snow 12° Laborers

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
15'± to 141'	7:00 A 8:30 8:30 9:15 9:15 11:45 11:45 12:30 12:30 P 1:30 4:30 5:30 5:30 6:00 6:00 6:00	gray, med to coarse sand w/ some fine to med. gravel		ODEX 165	45 min 6 ft 0.1 ft/min	Repair Hole Drill remainder of 6th casing Setting & welding 7th casing Lucy welding 7th casing Shove out hole & set up to drill Drilling permanently fix casing
106'		gray, fine to coarse sand w/ some gravel		165 ODD	30 min 25 ft 0.8 ft/min	
						11 hrs

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ROCK ANCHOR TEST LOG

Anchor No. RAI1 Batter Supervisors
 Date 2/8 ~ 2/9/79 G.S. Elev Operators
 Observer D.T. Iso Weather Laborers

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
166'	19:00 19:40					Shift Change.
	21:00 22:40					Welding + grinding 5th section.
176'	0:10 1:30	Grey fine to coarse sand, graded w/ fine to med. gravel. Limestone.		ODEX 165	80 min 10 ft includes 2 ft weathered 3 ft sound rock	Drilling started at 0:10. While casing had ~20.0 ft stick-up , the flushing water turned clearer than before. Cutting mostly fine to med. gravel, graded w/ fine to coarse sand. There were some limestone chips but due to the mixed med. size gravels, it was not sure that the bit hit the bedrock. The operator said it seemed to be in bedrock now. It drilled another 3.0 ft and 3. could still catch gravel + sand w/ a bucket from the cutting. By that time drilling seemed to be very hard. I had the operator drilled another 2' to pit the casing.
top of rock 173(1)						

ROCK ANCHOR TEST LOG

Anchor No. RAI1 Batter Supervisors
 Date 2/8-2/9/38 G.S. Elev Operators
 Observer D.T. Bo Weather Laborers

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
	1:30 1:45					After casting was set into bedrock , ICS superintendent told me they would pull the last section of rod up and shut off the operation because of the extremely cold weather. (-5° F. Wind chill was -30 F.) Crew knocked off at 1:45.
						6 hrs

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ROCK ANCHOR TEST LOG

Anchor No. RA-12 Batter 45° Supervisors _____
 Date 2-13-77 G.S. Elev 422 Operators _____
 Observer L. J. SETTS Weather _____ Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
0	1900 1930					SMART CHANGE, FUEL etc
1930						set up on hole location check w/ level inver - 2445 ± 0030 ±
0285						PRE-DRILLING (70" TEI - work)
0.0 1 20 ±	0285 0300			TEI - CONE After Bit & AIR	25 min	
0300 0330						COFFEE BREAK
20 ± 42 ±	0330 0410			"	40 min	PRE-DRILLING
0410 0530						Pull Rods & Bit
0530 0645						CLEAN AREA

* Log Planned by R. Moberly from ONLY Field Report of L. J. SETTS

ROCK ANCHOR TEST LOG

Anchor No. RA-12 Batter Supervisors
 Date 2-14/8-79 G.S. Elev Operators
 Observer L. J. E. S. Weather Laborers

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
42'	7:00 AM 11:45					Measurements to surface and
	11:45 12:30					curer
	12:30 3:30 PM					Measurements to surface and
	3:30 3:45					showing air
to 146'	3:45 5:00 PM		120 ±	ODAY 165 AM	50 minutes	Drilling 3rd casing in pre-drilled hole
	5:00 5:45					showing of casing
	5:45 7:00					clean casing from hole of 146 to 143

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ROCK ANCHOR TEST LOG

Anchor No. PA-22 Batter Supervisors

Date 2-15-79 G.S. Elev Operators

Observer P.G. Weather Laborers

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
14'	7:00 ' 11:45					modifications to cutters B.N.
	11:45 ' 12:30					cutters
	12:30 ' 1:30 ²					newing 3rd engine
	1:30 ' 6:45					modifications to cutters B.N.

ROCK ANCHOR TEST LOG

Anchor No. RA-12 Batter _____ Supervisors _____
 Date 2-18/12-79 G.S. Elev _____ Operators _____
 Observer C. S. S. S. Weather _____ Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
42'	1900					monitors to cutters
	1905					air
	1915					lunch
	1930					monitors to cutters
	1935					air
	1940					blowing out
	1945					
42'	0315	cut, w. fine cement grout	120 - 250	0.5 ft/min	25 min	drilling & cleaning (partially)
58'	0410					remains "
	0415					
58'	0415	"			10 min	drilling & cleaning (partially)
63'	0425				0.5 ft/min	repairs to casing head
	0435					

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Supervisors. _____
Operators _____
Laborers _____

[illegible]

ROCK ANCHOR TEST LOG

Anchor No. PA-32 Supervisors _____
 Date 2-16-79 Operators _____
 Observer L. Iselt Laborers _____
 Batter _____
 G.S. Elev _____
 Weather _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
71'	7:00 9:30					Showing material to clean out now.
	9:30 9:45					working material (225#)
	9:45 10:30					working up cuttings Bin
	10:30 11:30					lunch
	11:30 11:45					working up cuttings Bin
	11:45 2:45					more blasted - cleaning & blowing.
	2:45 3:35					preparation for drilling
71' 75'	3:35 3:45		120 - 250	00ex 165	10 min 0.4 ft/min	drilling 4" casing (partially)

ROCK ANCHOR TEST LOG

Anchor No. AB-12 Batter Supervisors
 Date 2-14/77 G.S. Elev Operators
 Observer C.I. Weather Laborers

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
75 ±	3:45A 4:30					Remains to drilling note
75 ±	4:30 5:30A		120 - 250	0044 165 mm	60 min 0.3 ft/min	Drilling + 3 casing (probably)
92 ±	5:30 6:45					cutting bit blew its bit 9000 ft cutting went on ground low air blowing

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ROCK ANCHOR TEST LOG

Anchor No. RA-12 Batter _____ Supervisors _____
 Date 2-17-79 G.S. Elev _____ Operators _____
 Observer Lincoln / R. G. / L. I. Weather Cold Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
92 ±	0700					weaving cutting spalls out of bin C 92.
	1145					RA 12 showing
	1145					RA 12 showing
	1230					RA 12 showing
96	1230					complete drilling of showing 4th casing
	2:45					reconstruction of weirs 5th casing
	5:15					LE 1000 over for RA
96	5:15					DRilling 5th casing
121	6:45					(a 5500-6000#)
	6:45					SHIFT CHANGE

ROCK ANCHOR TEST LOG

Anchor No. RA-12 Supervisors _____
 Date 2-17-8-79 Operators _____
 Observer Lee J. Hoff Laborers _____
 Batter _____
 G.S. Elev _____
 Weather _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
121'	2:45P					Blowing w/ low air pressure during shift change
	7:15					Preparation & wear of casing
	7:15					
	12:00A					
	12:50					Preparation for drilling
	1:40					
121'	1:40		125-	ODD	20 min	Drilling of casing
146'	2:00		250	165	1:25 ft/min	
	2:00					Blowing (low air)
	2:45					wear cuttings.
	2:45					
	3:15					
	3:45					BREAK
	3:45					
	5:00					clean up.

B-73

SHEET 42

ROCK ANCHOR TEST LOG

morning Shift

Anchor No. RAI-2 Batter 45° Supervisors BRAIN MAHAR
 Date 2/19/79 G.S. Elev ~ 422 Operators 2 WELDER
 Observer R.Q. Weather ~ 35° Laborers 4

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
14.5-10	07:00 to 11:30	N/A	N/A	N/A	N/A	loading + welding 1' grinding 7 1/2' segment 2.25' long
"	11:30 to 12:00	N/A	N/A	N/A	N/A	X-Ray for the 7th section can only weld taken
"	12:00 to 12:30	N/A	N/A	N/A	N/A	Lunch
"	12:30 to 14:05	N/A	N/A	N/A	N/A	removing wooden chackles and modifying the cutting Bin (A trapzoidal)
"						Bin is being mod by connecting the
"						there to the Bin
"						The Bin was covered by plywood sheet

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SHEET 2:2

ROCK ANCHOR TEST LOG

Anchor No. RA I-2 Supervisors BRAIN. MAHAR
 Date 2/19/79 Operators 2 INVELOER
 Observer R.P. Laborers 4
 Batter 45°
 G.S. Elev ~ 422
 Weather ~ 35°

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
145-10"	16:05	Gray fine #	120	ODEX	#	Remaining Time 14 mins
16-10"	16:35	medium SANDY to coarse	120	BIT (16-20")	16 mins	is for pulling the cutting
166-8"		dark, some fine gravel	210	+HAMMER	1:35/min	Air pressure 120 PSI for flushing the cutting 225 PSI for drilling + hammering operation
	16:05	N/A	N/A	N/A	N/A	Installation of 8th segment of casing in progress
	16:00					
	16:00					

146
1
167

ROCK ANCHOR TEST LOG

Anchor No. RA-52 Batter _____ Supervisors _____
 Date 2-19/80-79 G.S. Elev _____ Operators _____
 Observer R. Esch Weather _____ Laborers _____

1790
2/9

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
166.5	7:00.1					beginning of casing washing cuttings
	11:45					
	5:41					
	12:30.4					luna
	12:30					preparation of casing & prep to drill.
	1:15					attempting to get air blowing through rods.
	1:15					
	4:55					
166.5	5:05	SAND & GRAVEL	125 -	ODD	15 min	DRILLING PARTIAL OF Casing
176.9	5:20		250	165	0.77/min	
176.9	5:20	1.0 KILL - 176.9		ROD	20 min	DRILLING ROCK
179.0	5:40	Limestone				
179.0	5:40					CLEAN OUT CUTTING IN Hole
179.0	5:45					
179.0	5:45					beginning cuttings
	6:45					

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ROCK ANCHOR TEST LOG

Anchor No. RA-E-2 Supervisor
 Date 2-20-79 G.S. Elev
 Observer R. Messerly Weather RAIN - 1:00 - 3:00 PM
 Operators
 Laborers

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
1790'	7:00A					SMALL CHANGE, FUEL AT
	7:30					REMOVING EXCESS ROSS & CASING
	7:30					PULLING CAS, HANDED & D.T
	8:45					
	11:45					LUNING
	11:45					ADJUSTING TO DISCONNECT D.T.
	18:30P					DRONE WAREHOUSE
	1A:30					WAITING FOR SUBMERGENCE
	1:30					CRACKS DURING AND AFTER WAITING
	1:45					COME BACK DOWN HOLE
	1:45					
	8:14					
1790'	5:14	Limestone	125 -	6" DODGE ROCK B.T	27 min	SEALING ROCK SPECT
1990'	5:57		250	4" DODGE ROCK B.T	20'	16 min 7.5 EXTRACTED IN MIDDLE

0.7/min

ROCK ANCHOR TEST LOG

Anchor No. RE-1 Batter 45° Supervisors Rick Bowman
 Date 2-22-23-79 G.S. Elev 422 ± Operators R 1 other
 Observer L.I. RO Weather Light Showers To Heavy Laborers 3
Rain - Intense Fog, approx 35°

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
0'0" day To 17'2" shift		see day Report	"	"	"	see day Report
17'2" 015 hr To 32'0" 01530 hr		see day Report	42.5 To 42.5	ODEX BIT	30 sec	This area to 32'0" was Predicted we are setting casing to this depth now.
32'0" 050 hr To 45'11" 100 hr		Light Gray Fine SAND w/ Trace SHT SP	42.5 To 42.5	ODEX BIT	3 min 4.6 ft/min	went very smooth very good control. until has grouting effect to it (slightly)
45'11" 0620 To 78'5" 0635		"	"	"	4 min 6.4 ft/min	went very smooth.

* Air Pressure Flushing * Air Pressure Drilling Casing

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
96'-7" To " 120-8'	0105 0135	Gray fine to medium SAND trace silt	* 120 to ** 222	ODEX BIT	4 Mins 15 Sec 5.7 ft/min	Remaining time spent in holding the bore and unhooking the bar at the casing head.
				** for hammering the casing		*
		*for removing the cuttings				

70

1 -
WCC
Supervisors

U.S. Eley

Weather Cycles and coal

Operators

4 Laborers

B-81

Anchor No. RE-1
Date 2/24, 2/25/79
Observer R.Q.
Batter 45°
G.S. Elev 430 ft
Weather Partly cloudy 30°
Supervisors Rick Borenstein
Operators 2, 1011ER
Laborers 3

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
166'-6"	22 ⁴⁰	Chrom fine to coarse sand, some g.c.l.	120 *	ODEX	(6' x 1/2") 1 MIN	Ⓢ Remaining time for straightening here
176'-8"	22 ⁵⁵	fine to coarse fine " gravel	To 230 **	BIT	30 SEC	
176'-8"	22 ⁵³	Emerystone bedrock	120	ODEX	~ 1 MIN Ⓢ	Ⓢ Remaining time for straightening here
176'-8"	To 23 ⁰⁰	boulders	To 230	BIT	2.5 min	
	*	Air pressure for flushing the cuttings,			** Air pressure for hammering in cable outside	

* Air pressure for flushing the cuttings,	** Air pressure for hammering medical instruments
---	---

ROCK ANCHOR TEST LOG

Anchor No. RE-1 Batter Supervisors
 Date 2-26-79 G.S. Elev Operators
 Observer RL. MOSELEY Weather 20° AM 35° PM Laborers

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
178'8"	0700	-	-	-	-	START CHANGE, FIRST EQUIP THRU OUT ROOST W COMPRESSOR
	0800	-	-	-	-	LOWER ROOS (W/ROCK BIT) INTO HOLE
	0930	-	-	-	-	WAITING FOR CHEERY PICKER TO COME, NEEDED TO ADD ROOS
	1045	-	-	-	-	ADD DRILL ROOS & PERMITS TO DRILL BIT ONLY WENT TO 192'9"
	1125	-	-	-	-	REPAIR HOSE
	1145	-	-	-	-	LUNCH
	1245	-	-	-	-	REPAIR HOSE
	1313	-	-	-	-	DRILLING ROCK SOCKET
to 182'4"	1313 1327	GRAB, 6" W/ROCK W/ROCK BIT CINDERSTONE	120 - 250	6" ROCK BIT	14 min	

ROCK ANCHOR TEST LOG

Anchor No. RE-1 Batter _____ Supervisors _____
 Date 2-26-77 G.S. Elev _____ Operators _____
 Observer R.L. MOORELY Weather _____ Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
182.2	1327					STAND AT WHILE DISCUSSING
	1354					WHY SO MUCH SAND / GRAVEL IN
to	1354					Hole. After Rose up 10' of Sand
194.6	1418	Limestone	125- 250	6" OVER ROD BIT	24 min	STANDER CAME BACK IN TO 17372
	1418					DRILLING
	1443					BLOWING, CLEANING / ADDING
to	1508	Limestone	125- 250	"	25 min	DRILL ROD
201	1540					DRILLING
	1508					WATER COMING OUT RAZI
	1540					INCLINOMETER - DISCUSSION
to	1540	Limestone	"	"	18 min	CONCERNING WAY.
207.8	1558					DRILLING
	1558					PULLING RODS
	1635					MEASURED Hole AFTER ROSE PULLER
	1835					2.196'
						LEFT Pile FOR SHIFT CHANGE

ROCK ANCHOR TEST LOG

Anchor No. AE-1 Supervisors _____
 Date 2-27-79 Operators _____
 Observer R.L. McGee Laborers _____
 Batter _____
 G.S. Elev _____
 Weather _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
207'8"	0730					Start Charge, Fuel at
	0730					Attempts to Remove Bit
	1135					Curry
	1135					maxing grout
	1230					
	1300					Groutman - 4275 ¹ Cal. Grout Amperes under Flow unit Notes out top of hole
	1500					Adjusting casing w/ periscope Groutman Periscope
	1500					
	1850					

B-85

ROCK ANCHOR TEST LOG

Anchor No. RE-2 Batter 45° Supervisors _____
 Date 2-28-79 G.S. Elev _____ Operators _____
 Observer R. L. MOSLEY Weather 20-35° of mist Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
0	0900 1100					STAND BY WHILE GEC TOOK INDIATOR READINGS IN RE-1
0 1 40	1100 1105	CLAY	120	7/8" RE-1 CONE ROLLER BIT & AIR	45 [±] min	PRE DRILLING IN CLAY RIG IS NOT LINED UP CORRECTLY
	1230 1300					PULL ROOS & AIR
	1300 1400					SET UP RIG "CORRECTLY" ON HOLE
	1400 1530		120	7/8" RE-1 CONE ROLLER BIT		RE-PRE-DRILL
0 1 20	1530 1625					SET & LOWERED 1ST CASING
	1625 1845					PREPARATION & WELDING 2ND CASING
						SHIFT CHANGE

production since 7 hrs

ROCK ANCHOR IES I LUG

Sheet 172
Supervisors Rick Balcer
Operators 2, 10112
Laborers 3

Batter	43'
G.S. Elev	422+
Weather	Shower, 5.38 ⁰

Anchor No. RE-2
Date 2/28, 3/1/79
Observer R. G.

[illegible]

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Sheet 272

ROCK ANCHOR TEST LOG

Anchor No. RE-2 Supervisors RICK BOREMAN
 Date 2/20/3/1/79 Operators 2 IDLER
 Observer R. G. Laborers 3
 Batter 45°
 G.S. Elev 422.1
 Weather Shower 38°

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
20'3 to 45'1"	2105 to 2125	* Grayish clay cgl T ₁ ~ 35 ft. 11 ft from 35' to 45' 11 ft Gray to brown fine to medium sand, trace silt, SP, N.D.	120** 220**	ODEX BIT	~4 MIN 6.3 ft/min	* Pre-drilled depth to ~40 ft *** remaining time straightening the bore, and injection operation during drilling operation to welding 3rd segment 20'6" long
N/A	2125 to 0210		N/A	N/A	N/A	Easy + smooth drilling Very low amount of water (fine sand as compared to water @ a greater depth)
45'1" to 70'2"	0210 to 0230	Gray fine to medium sand, trace silt, SP	120** 220**	ODEX BIT	~3 MIN 8.4 ft/min	Welding + grouting 4th section + casing 20' long
1' "	0230 to 7.00					Productive time 12 hrs

3/1/79

** 120 to flush air cutting ** 220 for hammering mechanism

ROCK ANCHOR TEST LOG

Anchor No. RE-2 Batter _____ Supervisors _____
 Date 3-1-79 G.S. Elev _____ Operators _____
 Observer R. M. B. B. L. Weather 35°-40° mild, cloudy Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
20'2"	0700 0730					Shift change, Fuel etc
	0730 0758					Preparation for drilling
	0758 0805					TURNED AIR ON - CUTTING (ARE) STARTED COMING & 0805
95'4"	0805 0810	GRAY, FINE-MED SAND w/ trace of gravel	120 - 220	165 mm ODEX	5 min 5.0 ft/min	DRILLING 4th CASING
	0810 0812					Blowing
	0812 0845					WEIGHING CUTTINGS
	0845 1000					CHEERY PICKER sent to pile DRIVING AREA - DRILLING OPERATIONS HALTED.
	1000 1030					WEIGHING CUTTINGS

ROCK ANCHOR TEST LOG

Anchor No. RE-2 Supervisors _____
 Date 3-1-77 G.S. Elev _____ Operators _____
 Observer _____ Weather _____ Laborers _____

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
1030 95'4"	1030 1145					PREP. & WELDING 5" CASING
1145 1230	1145 1230					CURRY WELDING 5" CASING
1230 1300	1230 1300					WAITING FOR TESTING LAB TO X-RAY WELD
1300 1400	1300 1400					X-RAY 5" WELD
1400 1430	1400 1430					BLASTING AIR - NO RETURN UNTIL 1454
1430 1454	1430 1454					DRILLING 5" CASING
95'4" 102'1"	1454 1457	GREENISH GRAY, FINE SANDY CL, SOME SILT (P-R-M)	120 220	165mm O.D. 4"	3 min 22 ft/min	REPAIR DRILLING HEAD net cutting loss = 100"
1457 1510	1457 1510					

B-90

ROCK ANCHOR TEST LOG

1052

Anchor No. 25-2Batter 45°Date 2-2-79G.S. Elev Observer I. V. LeeWeather Success and sea changing to rain
Heavy rain 8:00 PM
 WCC 1
 Supervisors 1
 Operators 2
 Welders 1
 Laborers 3

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
	07:00 to 11:30					See 2. Moberly report
	11:30 to 12:30					Lunch
	12:30 to 13:15					Outing for pit
164'-6" to 165'-0"	13:17 to 13:21		110 230	Odex 165		Drilling
	13:21 to 14:15					Fixing discharge head
176'-3" to 176'-7"	14:25 to 14:27		110 230	Odex 165	6 min 1.1 ft/min	Drilling until rod stuck
	14:28 to 14:45					rod broke free and dropped to 15' at 176' 3"
176'-3" to 181'-3"	15:08 to 15:22	limestone	300	Odex 165	14 min for 5 ft	Drilling rock socket

Observer I. V.

Weather

Laborers

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[illegible]

SHIFT #2

ROCK ANCHOR TEST LOG

Anchor No. RE-2 Batter ~45° Supervisors RICK BOPEMAN
 Date 3/13/79 G.S. Elev 422t Operators 2 OPER, 10 LER
 Observer R.B. Weather Partly cloudy ~35° Laborers 3

Depth ft	Time	Description of Material	Air Pressure psi	Excavation Tools	Excavation Time	Remarks
119'-6"	12:00 to 0001	N/A	N/A	N/A	N/A	Welding and grinding 6th segment of casing and loading unloading shackles, removing material from hole, and welding rebar in. Time spent in straightening the hole.
119'-6" to 194'-6"	0001 to 0110	Gray fine to medium sand, trace of gravel, trace of iron pyrite	120 to 230	ODEX BIT	9 MINS 2.8 ft/min	weigh cuttings from 119'-6" to 144'-6" and loading, installing welding + grinding 7th segment of casing (2.34 ft length)
144'-6" to 169'-6"	0110 to 0545	N/A	N/A	N/A	N/A	weigh cuttings from 144'-6" to 169'-6" and loading, installing welding + grinding 8th segment of casing (2.34 ft length)
169'-6"	0545 to 0625	Gray fine to medium sand, trace of gravel, trace of iron pyrite	120 to 230	ODEX BIT	12 MINS 2.1 ft/min	weigh cuttings from 169'-6" to 184'-6" and loading, installing welding + grinding 9th segment of casing (2.34 ft length)
		Gravel SP				water discharge into bin, during the first 10 ft drilling
						water, sand, slurry shooting out from D-2 15 ft high also chugging

* Air pressure for flushing cutting * * * Air pressure for flushing + drilling

PHASE IV REPORT

VOLUME VA

**RESULTS AND INTERPRETATION OF
ROCK ANCHOR TEST PROGRAM**

APPENDIX C

GROUND INSTRUMENTATION DATA SHEETS

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C-1



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Consulting Engineers
Geologists and Environmental Scientists

DATA SHEET

Ground Instrumentation - Surface Reference Points

Rock Anchor Test

p. 1A of 4

Elevation & Change (Ft)

start RA-I										
Date	11 Oct 75	20 Oct 75	21 Oct 78	26 Oct 78		Initial	28 Dec 78	20 Dec 79	29 Dec 78	18 Jan 79
Time				08.00		Depth	60 ft	80 ft	10 ft	
No.										
RA-P1	420.523	420.518				420.520	420.495			420.488
	0.000	-0.005					-0.025			-0.068
										-0.032
R2		420.702	420.709	420.708		420.705	420.679			420.668
		0.000	+0.005	0.000			-0.026			-0.037
R3	420.642	420.638				420.640	420.601			420.552
	0.000	-0.005					-0.039			-0.049
R4	420.298	420.293				420.296	420.273			420.256
	0.000	-0.005					-0.023			-0.032
P5	420.392	420.388				420.390	420.367			420.359
		-0.005					-0.023			-0.031
R6		420.408	420.408	420.408		420.408	420.383			420.374
		0.000	0.000	0.000			-0.025			-0.034
P7	420.638	420.628		420.628		420.628	420.589			420.577
	0.000	-0.010		-0.010			-0.039			-0.051
P8	420.878	420.873				420.876	420.833			420.823
	0.000	-0.005					-0.043			-0.053
P9	420.563	420.558				420.560	420.532		420.53	420.506
	0.000	-0.005					-0.028		-0.03	-0.054
R10		420.678	420.683	420.678		420.680	420.647		420.64	420.634
		0.000	+0.005	0.000			-0.033		-0.04	-0.046
P11	420.778	420.773				420.776	420.739		420.73	420.715
	0.000	-0.005					-0.042		-0.05	-0.061
P12	420.348	420.343				420.346	420.320			420.310
	0.000	-0.005					-0.026			-0.036
P13	421.083	421.073		421.068		421.070	421.033			421.018
	0.000	-0.010		-0.015			-0.037			-0.052

WCC 1-8

WCC, Y7C825, Phase IV



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DATA SHEET

Ground Instrumentation - Surface Reference Points

Rock Anchor Test

P. 1B of 4

Elevation & Change (ft)

Date	start RA-T1								
	11 Oct 78	20 Oct 78	21 Oct 78	26 Oct 78	Initial	18 Dec 78	10 Dec 79	29 Dec 78	18 Feb 79
Time				0800	Depth	60ft	80ft	100ft	
No									
RA-R14	420.523	420.513			420.518	420.482		420.47	420.475
	0.000	-0.010				-0.035		-0.05	-0.050
R15		420.693	420.686	420.698	420.683	420.647		420.64	420.625
		0.000	+0.005	-0.005		-0.036		-0.04	-0.050
R16	420.823	420.813		420.808	420.810	420.768		420.76	420.754
	0.000	-0.010		-0.015		-0.042		-0.05	-0.056
R17		420.623	420.628	420.623	420.628	420.582	420.582	420.57	420.561
		0.000	-0.005	-0.010		-0.034	-0.034	-0.06	-0.067
R18	420.448	420.443			420.446	420.456	420.458		420.442
	0.000	-0.005				-0.040	-0.038		-0.054
R19	420.453	420.443			420.448	420.404	420.404	420.40	420.393
	0.000	-0.010				-0.044	-0.044	-0.05	-0.065
R20	420.528	420.518		420.508	420.513	420.470	420.470	420.46	420.446
	0.000	-0.010		-0.020		-0.043	-0.043	-0.05	-0.067
R21	421.698	420.689			421.693	420.638	420.638	420.62	420.617
	0.000	-0.010				-0.055	-0.055	-0.07	-0.076
R22	421.128	421.113		421.113	421.113	421.080	421.084		421.064
	0.000	-0.010		-0.010		-0.033	-0.033		0.049
R23		420.473	420.473		420.473	420.437	420.432		420.412
		0.000	0.000			-0.040	-0.041		-0.061
R24	420.398	420.473	420.388	420.383	420.386	420.348	420.350		420.336
	0.000	+0.125	-0.010	-0.015		-0.038	-0.036		-0.052
R25	420.443	420.513	420.433	420.428	420.430	420.374	420.342		420.374
	0.000	+0.070	-0.010	-0.015		-0.101	-0.038		-0.056
R26	420.748	420.808	420.738	420.738	420.738	420.762	420.703		420.693
	0.000	+0.060	-0.010	-0.010		-0.036	-0.035		-0.055

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DATA SHEET

Ground Instrumentation - Surface Reference Points

Rock Anchor Test
Elevation & Change (Ft)

p. 1C of 4

					start RA-I				
Date	11 Oct '78	20 Oct '78	21 Oct '78	26 Oct '78	Initial	28 Dec '78	29 Dec '78	29 Dec '78	15 Jan '79
Time				0800	Depth	60ft	80ft	100ft	
No.									
RA-R27	420.443	420.353	420.358	420.353	420.354				420.300
	0.000	-0.110	-0.105	-0.110					-0.050
R28		420.443	420.468		420.466	420.425	420.428		420.410
		0.000	+0.005			-0.041	-0.038		-0.056
R29	420.973	420.923	420.928	420.933	420.928	420.908	420.887		420.899
	0.000	-0.050	-0.045	-0.040		-0.020	-0.041		-0.029
R30	420.418	420.518	420.408	420.408	420.408	420.382	420.384		420.372
	0.000	+0.100	-0.010	-0.010		-0.026	-0.024		-0.035
R31	420.468	420.453	420.453	420.453	420.453	420.417	420.421	420.41	420.402
	0.000	-0.015	-0.015	-0.015		-0.036	-0.032	-0.04	-0.047
R32	420.748	420.728	420.743		420.746	420.710	420.714	420.70	420.701
	0.000	-0.020	-0.005			-0.036	-0.032	-0.035	-0.045
R33	420.563	420.553	420.553		420.553	420.515			420.516
	0.000	-0.010	0.010			-0.038			-0.037
R34	420.803	420.798	420.803		420.801	420.763			-
	0.000	-0.005	0.000			-0.038			
R35	420.408	420.543	420.403	420.398	420.403				420.398
	0.000	+0.135	-0.005	-0.010					-0.023
R36	420.713	420.678	420.683	420.678	420.680	420.651			-
	0.000	-0.035	-0.005	-0.025		-0.029			

C - 4



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DATA SHEET

GROUND INSTRUMENTATION (Surface Ref Pts)

ROCK ANCHOR TEST

p. 2A of 4

Elevation & Change (Ft)

DATE	Initial	23 JAN 79	4 FEB 79	8 Feb 79	14 FEB 79	15 FEB 79	16 Feb 79	17 Feb 79	17 Feb 79	18 Feb 79
DEPTH		114 ft.	140 ft.	166 ft	46 ft	71 ft.		10 ft	125 ft	150 ft
No.								RAI2	RAI2	RAI2
RA-R1	420.520			420.388						
				- 0.132						
R-2	420.705			420.664						
				- 0.041						
R-3	420.640			420.585						
				- 0.055						
R-4	420.296									
R-5	420.390		420.367	420.348						419.959
			- 0.023	- 0.042						- 0.431
R-6	420.408		420.373							
			- 0.035							
R-7	420.628		420.572	420.567						
			- 0.056	- 0.061						
R-8	420.876									
R-9	420.560	420.527	420.920							
		- 0.033	0.360?							
R-10	420.680	420.635	420.633							
		- 0.045	- 0.047							
R-11	420.776	420.722								
		- 0.054								
R-12	420.346	420.393								
		+ 0.047								
R-13	421.070	420.016							420.973	
		- 0.054							- 0.097	

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DATA SHEET

GROUND INSTRUMENTATION (Surface Ref Pts)

ROCK ANCHOR TEST

p. 2B of 4

Elevation & Change (ft)

complete start
RA-I1 RA-I2

DATE	Initial	13 JAN 79	4 FEB 79	8 FEB 79	14 FEB 79	15 FEB 79	16 FEB 79	17 FEB 79	17 FEB 79
DEPTH		114 ft.	140 ft	166 ft	46 ft	71 ft	check	109 ft	125 ft
No									
RA-R14	420.518	420.468							
		-0.050							
R15	420.693	420.632							
		-0.051							
R16	420.810	420.750							
		-0.060							
R17	420.628	420.559				420.502			
		-0.069				-0.126			
R18	420.496	420.440				420.401	420.403	420.399	420.398
		-0.056				-0.095	-0.073	-0.097	-0.098
R19	420.448	420.376				420.322			
		-0.072				-0.125			
R20	420.513	420.439				420.337			
		-0.074				-0.176			
R21	421.693	420.610				420.554			
		-0.083				-0.139			
R22	421.113	421.059				-0.050			421.018
		-0.054				-0.083			-0.095
R23	420.473	420.401			420.360	420.349	420.350		
		-0.072			-0.113	-0.124	-0.125		
R24	420.386	420.326				420.294			
		-0.060				-0.092			
R25	420.430	420.365			420.337	420.324			
		-0.065			-0.002	-0.106			
R26	420.738	420.678			420.662	420.653			
		-0.060			-0.076	-0.085			

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DATA SHEET

GROUND INSTRUMENTATION (Surface Ref. Pts.)

ROCK ANCHOR TEST

p. 26 of 4

Elevation & Change (ft)

DATE	Initial	23 JAN 73	4 Feb 73	8 Feb 73	14 Feb 73	15 Feb 73				
DEPTH		114 ft	140 ft	166 ft	46 ft	71 ft				
No.										
RA-R27	420.354	420.314				420.298				
		-0.040				-0.056				
R-28	420.466	420.404				420.386				
		-0.062				-0.080				
R-29	420.928	420.895								
		-0.033								
R-30	420.408	420.364								
		-0.044								
R-31	420.453	420.399				420.386				
		-0.054				-0.053				
R-32	420.746	420.694				420.700				
		-0.052				-0.046				
R-33	420.553									
R-34	420.801									
R-35	420.403									
R-36	420.680									

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DATA SHEET

GROUND INSTRUMENTATION - (Surface Ref. Pts.)

Rock Anchor Test

p. 3A of 4

Elevation & Change (Ft)

Date	Initial	complete		start		complete		complete	
		RA-12		RE-1		RE-1		RE-1	
		19 Feb 79		22 Feb 79	23 Feb 79	22 Feb 79	28 Feb 79	29 Feb 79	28 Feb 79
Depth		166 ft		2 ft	45 ft	26 ft	120 ft	150	176
No.		RA12		RE1	RE1				RE1
RA-R1	420.520								420.462
									- 0.058
R2	420.705								421.032
									+ 0.327
R3	420.640								420.557
									- 0.083
R4	420.296								420.219
									- 0.077
R5	420.390	420.336							420.308
		- 0.054							- 0.082
R6	420.408	420.306							420.254
		- 0.102							- 0.152
R7	420.628								420.511
									- 0.117
R8	420.876	420.772							
		- 0.104							
R9	420.560	420.458				420.442	420.442	420.431	
		- 0.102				- .118		- 0.129	
R10	420.680	420.567				420.555	420.555	420.542	
		- 0.113				- .125		- 0.138	
R11	420.776	420.672				420.651	420.651	420.641	
		- 0.104				- .125		- 0.135	
R12	420.346						420.235	420.226	
								- 0.120	
R13	421.070						420.941		

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DATA SHEET

GROUND INSTRUMENTATION - (Surface Ref Pts)

ROCK ANCHOR TEST

p. 3B of 4

		Elevation & Change (Ft)							
		complete RA-12	start RE-1						
Date	Initial	19 Feb 79	22 Feb 79	15 Feb 79	22 Feb 79	22 Feb 79	23 Feb 79	23 Feb 79	26 Feb 79
Depth			71 ft	45 ft	94 ft		120 ft	150 ft	170 ft
No.			RE 1						RE 1
RA-R14	420.518				420.518	420.512	420.508	420.362	420.352
					-0.153	-0.155			-0.166
R15	420.683				420.512	420.491	420.509	420.471	420.502
					-0.168	-0.212			-0.115
R16	420.810				420.657	420.625	420.635	420.635	420.624
					-0.173	-0.175			-0.114
R17	420.628				420.410		420.426		420.417
					-0.209				-0.211
R18	420.496		420.551				420.376		420.373
			-0.115						-0.123
R19	420.448		420.306		420.333		420.274		420.271
			-0.142		-0.169				-0.197
R20	420.513				420.310				420.303
					-0.203				-0.211
R21	421.693				420.436		420.481		420.480
					-0.217				-0.213
R22	421.113		420.992				420.995		420.998
			-0.117						-0.123
R23	420.473								
R24	420.386		420.281				420.280		420.277
			-0.105						-0.108
R25	420.430		420.301	420.303			420.301		420.299
			-0.129	-0.123					-0.121
R26	420.738								

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DATA SHEET

GROUND INSTRUMENTATION (Surface Ref. Pt)

ROCK ANCHORS TEST

p. 3C of 4

Date	Initial	Elevation & Change (ft)							
		complete RA-12	start RE-1						complete RE-1
Depth							120 ft		176 ft
No									RE-1
RA-R27	420.354		420.295	420.295			420.246	420.246	
			-0.056	-0.061				-0.058	
R28	420.466		420.368				420.359	420.363	
			-0.098					-0.103	
R29	420.928								
R30	420.408								
R31	420.453								
R32	420.746		420.689	420.695			420.698	420.692	420.692
			-0.057	-0.061				-0.058	-0.054
R33	420.553								
R34	420.801								
R35	420.463								
R36	420.680								

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DATA SHEET

Ground Instrumentation

Surface Ref. Pts.

Rock Anchor Test

p. 4A of 4

Elevation & Change (Ft)

Date	Initial	start RE-2					complete RE-2			
		2/20/79	3/1/79	3/1/79	3/1/79	3/1/79	3/2/79	3/5/79		
Depth		45 ft	70 ft	100 ft	120 ft	145 ft	170 ft	194 ft		
No		RE2	RE2	RE2	RE2	RE2	RE2	Drilling Activities		
RA R1	420.500						420.456	420.457		
							-0.064	-0.063		
R2	420.705						420.628	420.631		
							-0.077	-0.074		
R3	420.640						420.551	420.553		
							-0.089	-0.087		
R4	420.246						420.208	420.209		
							-0.088	-0.087		
R5	420.390						420.299	420.298		
							-0.091	-0.092		
R6	420.408						420.291	420.285		
							-0.117	-0.123		
R7	420.628						420.500	420.499		
							-0.128	-0.129		
R8	420.876						420.752	420.754		
							-0.124	-0.122		
R9	420.560						420.417	420.418	420.416	
							-0.143	-0.142	-0.144	
R10	420.680						420.523	420.521	420.518	
							-0.157	-0.159	-0.162	
R11	420.776						420.621	420.621	420.618	
							-0.155	-0.155	-0.158	
R12	420.396					420.218	420.216	420.213		
						-0.128	-0.130	-0.133		
R13	421.070					420.924	420.921	420.922		
						-0.146	-0.149	-0.148		
R14	420.518				420.348	420.341	420.337	420.337	420.337	
					-0.170	-0.179	-0.181	-0.181	-0.181	
R15	420.683				420.497	420.483	420.483	420.484	420.489	
					-0.186	-0.195	-0.200	-0.199	-0.199	
R16	420.810				420.622	420.613	420.610	420.610	420.610	
					-0.188	-0.197	-0.200	-0.200	-0.200	
R17	420.620				420.414	420.403	420.403	420.403	420.403	
					-0.214	-0.225	-0.225	-0.225	-0.228	
R18	420.496		420.370		420.363		420.364	420.363		
			-0.126		-0.133		-0.132	-0.133		
R19	420.448		420.245	420.245	420.257		420.257	420.253		
			-0.183	-0.188	-0.191		-0.191	-0.195		

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DATA SHEET

Ground Instrumentation

Surface Ref Pt

Rock Anchor Test

p. 4B of 4

Elevation & Change (ft)

Date	Initial	start RE-2				complete RE-2			
		2/28/79	3/1/79	3/1/79	3/1/79	3/3/79	3/5/79		
Depth		45 ft	70 ft	100 ft	120 ft	176 ft	Active Drilling		
No		RE2		RE2	RE2	RE2	Actual		
PA-R 20	420.513		420.297	420.296	420.287	420.286	420.283		
			-0.216	-0.217	-0.226	-0.227	-0.230		
R21	421.693		420.475	420.473	420.465	420.462	420.458		
			-0.218	-0.220	-0.228	-0.231	-0.235		
R22	421.113		420.987		420.977	420.979	420.978		
			-0.126		-0.136	-0.134	-0.135		
R23	420.423		—		—		420.225		
							-0.198		
R24	420.386	420.272	420.273		420.265		420.267		
		-0.114	0.113		-0.121		0.119		
R25	420.430	420.292	420.289		420.280	420.282	420.279		
		-0.138	-0.141		-0.150	-0.148	-0.151		
R26	420.738	420.621	420.621		420.611		420.607		
		-0.117	0.117		-0.127		-0.131		
R27	420.354		420.294		420.292	420.294	420.297		
			-0.060		-0.062	-0.060	-0.057		
R28	420.466	420.355	420.355		420.348		420.345		
		-0.111	-0.111		-0.118		-0.121		
R29	420.928	—	—		—		420.829		
							-0.044		
R30	420.408	420.312	420.364		420.358		419.963		
		-0.036	-0.034		-0.150		0.445		
R31	420.453	420.376	420.376		420.370		420.374		
		-0.077	-0.077		-0.083		-0.079		
R32	420.746	420.685	420.687		420.680	420.683	420.684		
		-0.061	-0.059		-0.066	-0.063	-0.062		
R33	420.553								
R34	420.801								
R35	420.403								
R36	420.680								

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DATA SHEET

Ground Instrumentation - Borros Points

Rock Anchor Test
Elevation & Change (Ft)

p. 1 of 4

start RA-I									
Date	11 Oct '78	20 Oct '78	26 Oct '78		19 Oct '78	28 Oct '78	29 Oct '78	19 Jan '79	
Time			08.00		60 ft	80 ft	100 ft		
No									
PA-H1	420.849	420.853			420.850	420.849		420.846	
	0.000	+0.005				-0.001		-0.004	
					3				
H2	421.058	421.063			421.066	421.063		421.064	
	0.000	+0.005				+0.003		+0.001	
H3		420.973	420.973		420.973	420.968		420.965	
		0.000	0.000			-0.005		-0.003	
H4	420.718	420.718	420.718		420.718	420.719		420.717	
	0.000	0.000	0.000			+0.001		-0.001	
H5	421.168	421.168	421.168		421.168	421.169		421.171	421.166
	0.000	0.000	0.000			+0.001		+0.003	-0.002
H6	420.708	420.708	420.708		420.708	420.709		420.705	420.699
	0.000	0.000	0.000			-0.001		-0.003	-0.009
H7	421.643	421.653	421.653		421.653	421.642		421.636	
	0.000	+0.010	+0.010			-0.009		-0.017	
H8	420.838	420.833			420.836	420.838		420.835	420.832
	0.000	-0.005				+0.002		-0.001	-0.004
H9	421.213	421.208			421.210	421.194	421.194	421.190	421.180
	0.000	-0.005				-0.016	-0.016	-0.020	-0.030
H10	421.093	421.098	421.098		421.100	421.085	421.086		421.075
	0.000	-0.005	-0.005			-0.015	-0.014		-0.025
H11	421.528	421.523			421.526	421.510	421.513		421.502
	0.000	-0.005				+0.016	-0.013		-0.024
H12	421.028	421.003			421.006	420.987	420.981	420.980	420.974
	0.000	-0.005				-0.019	-0.025	-0.026	-0.022
									-0.042
H13	420.868	420.878	420.868		420.871	420.871	420.872	420.872	420.870
	0.000	+0.010	0.000			0.000	+0.001	+0.001	-0.001

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DATA SHEET

GROUND INSTRUMENTATION - Borros Points

ROCK ANCHOR TEST

p. 2 of 4

Elevation & Change (Ft)

DATE	Initial	23 JAN 79	3 FEB 79	5 FEB 79	14 FEB 79	15 FEB 79	16 FEB 79	17 FEB 79	17 FEB 79	18 FEB 79
DEPTH		114 Ft.	140 Ft.	166 Ft.	46 Ft.	71 Ft.	Check	106 Ft.	125 Ft.	150 Ft.
No								RAI2	RAI2	RAI2
RA-H1	420.850									
H2	421.063			421.066						
				+0.003						
H3	420.973									
H4	420.718		420.714	420.713						
			-0.004	-0.005						
H5	421.168	421.165	421.163	421.117					421.108	421.083
		-0.003	-0.005	-0.048	?				-0.060	-0.082
H6	420.708	420.700								
		-0.008								
H7	421.653	421.636							421.603	
		-0.017							-0.050	
H8	420.836	420.929	420.831							
		-0.007	-0.005							
H9	421.210	421.176				421.119		421.077	421.058	420.307
		-0.034				-0.091		-0.138	-0.152	-0.903
H10	421.100	421.074				421.045	421.049	421.045	420.898	420.483
		-0.026				-0.055	-0.051	-0.055	-0.702	-0.617
H11	421.526	421.499				421.476				420.370
		-0.027				-0.050				1.156
H12	421.006	420.953			420.918	420.901	420.903	420.891	420.888	
		-0.053			-0.088	-0.103	-0.103	-0.115	-0.118	
H13	420.871	420.865			420.874		420.878	420.873	420.873	
		-0.006			0.003		-0.002	+0.002	+0.002	

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DATA SHEET

GROUND INSTRUMENTATION - Borros Points

Rock ANCHOR TEST

p 3 of 4

Elevation & Change (Ft)

Date	Initial	19 Feb 79	complete RAI-2	start RE-1	22 Feb 79	22 Feb 79	22 Feb 79	22 Feb 79	24 Feb 79	complete RE-1
Depth		166 ft	179 ft	21 ft	21 ft	21 ft	21 ft	21 ft	21 ft	176 ft
No		RAI-2	RAI-2	RE-1	RE-1	RE-1	RE-1	RE-1	RE-1	RE-1
RA-H1	420.850		420.822							420.819
(395)			-0.028							-0.031
H2	421.063		421.049	421.054	-20.053	421.042	421.045	421.053	421.052	421.052
(305)			-0.014	-0.009	-0.010	-0.014	-0.015	-0.010	-0.011	
H3	420.973		420.937							420.934
(395)			-0.036							-0.039
H4	420.718	420.680	420.657	420.659	420.649	420.655	420.656	420.658	420.658	420.614
(325)		-0.038	-0.061	-0.059	-0.069	-0.063	-0.064	-0.060	-0.104	
H5	421.168	421.077	421.074	421.073	421.072	421.069	421.044	421.061	421.071	421.071
(345)		-0.091	-0.094	-0.093	-0.094	-0.097	-0.124	-0.107	-0.137	
H6	420.708		420.637							420.619
(395)			-0.071							-0.089
H7	421.653		421.573							421.583
(395)			-0.080							-0.070
H8	420.836	420.758	420.749	420.753	420.749	420.744	420.720	420.730	420.724	420.724
(365)		-0.078	-0.087	-0.083	-0.087	-0.092	-0.116	-0.106	-0.112	
H9	421.210	421.047	421.058	421.034	421.033	421.030	421.016	421.025	421.018	421.018
(395)		-0.163	-0.152	-0.176	-0.177	-0.180	-0.194	-0.185	-0.172	
H10	421.100		421.028	421.036				421.030	421.038	421.038
(395)			-0.072	-0.064				-0.070	-0.062	
H11	421.526		421.457	421.452				421.452	421.457	421.457
(395)			-0.069	-0.074				-0.074	-0.075	
H12	421.006		420.873		420.868	420.864	420.845	420.861	420.858	420.858
(395)			-0.133		-0.138	-0.142	-0.147	-0.145	-0.148	
H13	420.871		420.868	420.874	420.868	420.871	420.855	420.858	420.858	420.858
(395)			-0.003	0.003	-0.003	0.000	+0.003	-0.013	+0.005	

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DATA SHEET

GROUND INSTRUMENTATION - Borros Points

ROCK ANCHOR TEST

p. 4 of 4

Elevation & Change (ft)

		start RE-2				complete RE-2					
Date	Initial	28 Feb 79	1 Mar 79	1 Mar 79	1 Mar 79	2 Mar 79	3 Mar 79	5 Mar 79			
Depth		45 ft	70 ft	10 ft	120 ft	145 ft	End	45 ft			
NO.		RE 2	RE 2	RE 2	RE 2	RE 2	RE 2	RE 2			
RA H1	420.850						420.813	420.814			
(395)							-0.037	-0.036			
H2	421.063	421.097	421.052	421.049	421.048	421.045	421.044	421.048			
(305)		-0.016	-0.011	-0.014	-0.015	-0.018	-0.019	-0.015			
H3	420.973						420.928	420.930			
(395)							-0.045	-0.043			
H4	420.718	420.610	420.617	420.614	420.611	420.608	420.568	420.562			
(325)		-0.108	-0.101	-0.104	-0.107	-0.110	-0.150	-0.156			
H5	421.168	421.029	421.032	421.030	421.012	420.962	420.957	420.948			
(345)		-0.139	-0.136	-0.138	-0.156	-0.206	-0.211	-0.220			
H6	420.708						420.606	420.604			
(395)							-0.102	-0.104			
H7	421.653						421.551	421.551			
(395)							-0.102	-0.102			
H8	420.836	420.719	420.721	420.717	420.681	420.676	420.676	420.677			
(365)		-0.117	-0.115	-0.119	-0.155	-0.160	-0.160	-0.159			
H9	421.210	421.013	421.015	421.013	421.002	420.999	420.999	421.001			
(395)		-0.197	-0.195	-0.197	-0.208	-0.211	-0.211	-0.209			
H10	421.100		421.024		421.019		421.021	421.021			
(395)			-0.076		-0.081		-0.079	-0.079			
H11	421.526		421.447		421.438		421.441	421.441			
(395)			0.079		-0.088		-0.085	-0.085			
H12	421.006	420.850	420.850	420.846	420.838	420.836	420.837	420.833			
(395)		-0.156	-0.156	-0.160	-0.168	-0.170	-0.169	-0.173			
H13	420.871	420.875	420.875		420.871	420.872	420.879	420.878			
		+0.004	+0.004		0.000	+0.001	+0.005	+0.007			



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DATA SHEET

Ground Instrumentation - Sondex

Rock Anchor Test - RA 3D1

D. 1A-F 2

Elevation & Change (ft)

start		complete		complete		complete	
RA-I1		RA-I1		RA-I2		RE-1	
Date	Time	Initial	Final	RA-I1	RA-I2	RA-I2	RE-1
12 Oct 78	20 Oct 78	421.31	421.31	421.31	421.31	421.31	421.31
				0.00	0.00		0.00
		415.68	415.68	415.68	415.68	415.68	415.68
			0.00	-0.03	-0.05	-0.03	-0.03
		405.97	405.97	405.97	405.97	405.97	405.97
			0.00	-0.01	-0.02	-0.01	-0.02
		396.49	396.50	396.49	396.50	396.49	396.50
			+0.01	-0.03	-0.04	-0.05	-0.05
		386.74	386.75	386.74	386.75	386.74	386.75
			+0.01	+0.01	-0.01	-0.01	-0.02
		376.44	376.44	376.44	376.44	376.44	376.44
			0.00	-0.01	-0.02	-0.01	-0.02
		366.66	366.69	366.66	366.69	366.66	366.69
			+0.03	+0.02	-0.01	-0.02	-0.01
		356.34	356.33	356.34	356.33	356.34	356.33
			0.01	-0.01	-0.01	-0.03	-0.04
		346.59	346.60	346.59	346.60	346.59	346.60
			-0.01	-0.01	-0.03	-0.03	-0.03
		336.63	336.63	336.63	336.63	336.63	336.63
			0.00	0.00	-0.03	-0.03	-0.04
		331.87	331.86	331.87	331.86	331.87	331.86
			0.01	0.00	-0.01	-0.05	-0.06
		326.88	326.89	326.88	326.89	326.88	326.89
			-0.01	+0.01	-0.01	-0.05	-0.05
		321.81	321.82	321.81	321.82	321.81	321.82
			-0.01	-0.01	-0.04	-0.05	-0.06

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DATA SHEET

Ground Instrumentation - Sondex

Rock Anchor Test - RA 3DI

p.1B of 2

Elevation & Change (Ft)

Date	12 Oct 78	20 Oct 78	start RA-I		complete RA-I		complete RA-I2		complete RE-I	
			Initial	28 Dec 78	29 Dec 78	9 Feb 79	8 Feb 79	20 Feb 79	25 Feb 79	
Time						Final	RAI1	RAI2	RE1	
Top of casing	421.31	421.31								
	316.52	316.53	316.52	316.53		316.49	316.48	316.46	316.44	
		-0.01		+0.01		-0.03	-0.04	-0.06	-0.08	
	311.70	311.72	311.71	311.71		311.68	311.67	311.67	311.66	
		-0.02		0.00		-0.03	-0.04	-0.04	-0.05	
	306.80	306.82	306.81	306.81		306.76	306.72	306.84	306.84	
		-0.02		0.00		-0.05	-0.19	+0.03	.03	
	301.88	301.90	301.89	301.89		301.84	301.82	301.92	301.91	
		-0.02		0.00		-0.05	-0.07	+0.03	.02	
	296.33	296.34	296.34	296.29		296.24		296.28	296.25	
		-0.01		-0.05		-0.10		-0.06	-0.05	
	291.28	291.28	291.28	291.21		291.14		291.18	291.16	
		0.00		-0.07		-0.14		-0.10	-0.12	
	286.20	286.21	286.20	286.07		286.07		286.11	286.10	
		-0.01		-0.13		-0.13		-0.09	-0.10	

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DATA SHEET

Ground Instrumentation - Sondex

Rock Anchor Test - RA 3D1

p. 2A of 2

Elevation & Change (Ft)

complete
RF-2

Date	Initial	2/18/99	5/14/99	6/16/99	6/16/99
Depth		176 ft	after drilling activities		
Top of Casing	421.31	421.31	421.31	421.31	421.31
		.00	.00		
	415.68	415.70	415.53	415.48	415.54
		.02	-.15	-0.20	-0.14
	405.97	405.83	405.81	405.85	405.91
		-.14	-.06	-0.12	-0.06
	396.50	396.48	396.39	396.44	396.41
		-.02	-.11	-0.06	-0.09
	386.74	386.61	386.68	386.72	386.69
		-.13	-.06	-0.02	-0.05
	376.44	376.31	376.38	376.41	376.39
		-.13	-.08	-0.03	-0.05
	366.68	366.68	366.60	366.65	366.62
		.00	-.08	-0.03	-0.06
	356.34	356.18	356.25	356.29	356.26
		-.16	-.09	-0.05	-0.08
	346.60	346.38	346.44	346.40	346.46
		-.22	-.16	-0.20	-0.14
	336.63	336.39	336.45	336.51	336.47
		-.24	-.18	-0.12	-0.16
	331.86	331.62	331.69	331.72	331.70
		-.24	-.17	-0.14	-0.16
	326.88	326.78	326.70	326.74	326.71
		-.10	-.18	-0.14	-0.17
	321.82	321.71	321.69	321.58	321.64
		-.11	-.13	-0.24	-0.18
	316.52	316.42	316.35	316.36	316.35
		-.10	-.19	-0.16	-0.17
	311.71	311.50	311.57	311.51	311.58
		-.21	-.14	-0.20	-0.13
	306.81	306.71	306.78	306.69	306.79
		-.10	-.03	-0.18	-0.02
	301.89	301.74	301.87	301.79	301.85
		-.05	-.02	-0.10	-0.01
	296.34	296.28	296.22	296.21	296.22
		-.06	-.12	-0.13	-0.12

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**Consulting Engineers,
Geologists and Environmental Scientists**

DATA SHEET

Ground Instrumentation - Sondex

Rock Anchor Test - RA3D1

P. 2B of 2

Elevation & Change (Ft)
complete
RE-2

Date	Initial	20 March 79	5 March 79 after drilling activities	6 March 79	6 March 79
Depth		176 ft			
Pole No.					
	291.28	291.04	291.10	291.04	291.11
		- .24	- .18	- 0.24	- 0.17
	286.20	285.97	286.04	285.76	286.05
		- .23	- .16	- 0.44	- 0.15

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DATA SHEET

Ground Instrumentation - Sondex

Rock Anchor Test - RA3D2

p. 1A of 3

Elevation & Change (Ft)

 Corrections on
 24 Oct 78 start RA-I

Date	12 Oct 78	20 Oct 78	24 Oct 78	25 Oct 78	25 Oct 78	24 Oct 78		Initial	28 Oct 78	24 Dec 78
Time				16 45	16 50					
Top of										
Casing	421.21	421.21	421.22	421.22	421.22	421.22		421.22	421.22	421.22
		-0.00	+0.01	+0.01	+0.01	+0.01			.00	.00
	413.94	413.87	413.94	413.95	413.95	413.94		413.94	413.83	413.89
		-0.07	0.00	+0.01	+0.01	0.00			-.06	-0.03
	403.97	403.99	403.97	403.97	403.98	403.97		403.98	403.80	403.90
		+0.02	0.00	0.00	+0.01	0.00			-.05	-0.05
	393.97	393.91	393.97	393.99	393.99	393.97		393.98	393.92	393.02
		-0.08	-0.02	0.00	0.00	-0.02			-.06	-0.00
	384.06	383.98	384.04	384.07	384.07	384.04		384.06	384.02	384.00
		-0.08	-0.02	+0.01	+0.01	-0.02			-.04	-0.03
	374.04	373.94	374.04	374.04	374.04	374.04		374.04	374.02	374.00
		-0.10	0.00	0.00	0.00	0.00			-.02	-.04
	364.01	363.95	364.02	364.02	364.03	364.02		364.02	363.97	363.99
		-0.06	+0.01	+0.01	+0.02	+0.01			-.05	-.04
	354.03	353.97	354.04	354.04	354.05	354.04		354.04	353.98	
		-0.06	+0.01	+0.01	+0.02	+0.01			-.06	
	344.07	344.00	344.06	344.08	344.09	344.06		344.07	344.05	
		-0.07	-0.01	+0.01	+0.02	-0.01			-.02	
	339.09	339.02	339.05	340.00	339.09	339.05		339.08	339.00	
		-0.07	-0.04	+0.01	0.00	-0.04			-.04	
	334.07	334.00	334.00	334.08	334.07	334.07		334.07	334.01	
		-0.07	-0.07	+0.01	0.00	0.00			-.06	
	329.07	329.00	329.06	329.08	329.08	329.06		329.07	329.02	
		-0.07	-0.01	+0.01	+0.01	-0.01			-.05	
	324.06	323.99	323.92	324.06	324.06	324.63		324.05	323.99	
		-0.07	-0.14	0.00	0.00	+0.03			-.06	

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DATA SHEET

Ground Instrumentation - Sondex

Rock Anchor Test - RA3DZ

p. 1B of 3

Elevation & Change (ft)

Corrections on
24 Oct 78 start RA-12

Date	12 Oct 78	20 Oct 78	24 Oct 78	25 Oct 78	25 Oct 78	24 Oct 78	Initial	28 Dec 78	23 Feb 79
Time				1645	1650				
Top of									
Casing		421.213	421.22	421.22	421.22	421.22			
	319.04	318.98	318.93	319.05	319.05	319.05	319.05	319.00	
		-0.06	-0.11	+0.01	+0.01	+0.01		-0.05	
	314.12	313.92	314.04	314.13	314.12	314.10	314.12	314.06	
		-0.20	-0.08	+0.01	0.00	-0.02		-0.06	
	309.05	308.87	309.04	309.07	309.07	309.04	309.05	309.00	
		-0.18	-0.01	+0.02	+0.02	-0.01		-0.05	
	304.11	303.93	304.09	304.12	304.12	304.05	304.11	304.05	
		-0.18	-0.02	+0.01	+0.01	+0.06		-0.06	
	299.10	299.03	298.98	299.10	299.10	299.08	299.10	299.09	
		-0.07	-0.12	0.00	0.00	-0.02		-0.11	

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DATA SHEET

Groundwater Monitoring - Sondek

Rock Anchor Test - RA 302

p. 2A of 3

Elevation & Change (Ft)

Date	Interval	complete RA-I				start RA-I2		complete RA-I2	complete RE-1
		23 Jan 79	2 Feb 79	8 Feb 79	9 Feb 79	17 Feb 79	18 Feb 79	20 Feb 79	25 Feb 79
		114 Ft.	discontinuity 115	115	115	125 ft	150 (146 ft)	179 ft	176 ft
						RAI2	RAI2	RAI2	RE1
		421.22	421.22	421.22	421.22	421.27	421.27		421.29
		0.00	0.00			0.05			
		413.84	413.83	413.85	413.84	413.89	413.90	413.89	413.85
		-0.10	-0.11	-0.09	-0.10	-0.05	-0.04	-0.05	-0.04
		403.98	403.85	403.83	403.86	403.90	403.91	403.9	403.90
		-0.13	-0.15	-0.12	-0.17	-0.08	-0.07	-0.08	-0.07
		393.98	393.88	393.85	393.88	393.92	393.92	393.91	393.91
		-0.10	-0.13	-0.10	-0.20	-0.06	-0.06	-0.07	-0.09
		384.06	383.99	383.85	383.99	384.02	384.03	384.02	384.0
		-0.07	-0.21	-0.07	-0.17	-0.04	-0.03	-0.04	-0.05
		374.04	373.99	373.95	373.97	374.03	374.03	374.01	374.00
		-0.05	-0.09	-0.05	-0.14	-0.01	-0.01	-0.03	-0.04
		364.02	363.90	363.90	363.93	363.95	363.93	363.92	363.9
		-0.12	-0.12	-0.09	-0.16	-0.07	-0.09	-0.10	-0.13
		354.02	353.96	353.91	353.93	353.96	353.92	353.89	353.85
		-0.09	-0.13	-0.11	-0.16	-0.08	-0.12	-0.15	-0.19
		344.02	344.01	343.95	343.96	344.01	343.94	343.93	343.85
		-0.06	-0.12	-0.11	-0.18	-0.06	-0.13	-0.14	-0.19
		334.03	333.00	332.97	332.98	332.92	332.96	332.95	332.89
		-0.08	-0.11	-0.10	-0.17	-0.06	-0.12	-0.13	-0.19
		324.03	323.99	323.89	324.01	324.07	324.07	324.08	324.02
		-0.08	-0.18	-0.06	-0.10	-0.08	0.00	+0.01	-0.07
		324.02	323.96		324.00	324.07	324.08	324.09	324.06
			-0.11		-0.07	-0.07	+0.01	+0.02	-0.01
		324.05	323.94		323.96	324.05	324.08	324.09	324.05
			-0.11		-0.09	0.00	+0.03	+0.04	-0.04

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DATA SHEET

Ground Instrumentation - Sondex

Rock Anchor Test - RG302

p. 2B of 3

Elevation & Change (Ft)

Elevation & Change (ft)					complete RA-I1	start RA-I2	complete RA-I2	complete RE-1
DATE	TIME	23 JAN 79	28 FEB 79	8 FEB 79	9 FEB 79	18 Feb 79	20 Feb 79	25 Feb 79
TIME		114	discontinue INDEX 115	166 FT	Final		179 FT	176 FT
TO - O.								
CHANGE								
310.05			318.95	318.98	318.96		319.07	319.10
			-0.10	-0.07	-0.09		+0.03	+0.05
314.12				314.04	313.92	314.01	314.15	314.16
				-0.08	-0.26	-0.11	+0.01	+0.04
305.05				308.99	308.97		309.09	309.10
				-0.06	-0.03		+0.04	+0.04
304.11				304.02	303.97		304.13	304.12
				-0.09	-0.14		+0.02	+0.02
299.10					298.95		299.12	299.12
					-0.15		+0.02	+0.02

WFB 1-8

checked HN APR 20 1979

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DATA SHEET

Ground Instrumentation - Sondex

Rock Anchor Test - RA302

p. 3 of 3

Elevation & Change (Ft)

complete
RE-2

Date	Initial	2 March 79	5 March 79	6 March 79	8 March 79	Final			
Depth	REV	144 ft	176 ft						
No.	150 ft	RE2							
Top of Casing	421.22	421.27	421.27	421.22	421.22	421.22	421.22		
		.05	.05	.00	.00	0.00			
	413.94	413.92	413.89	413.85	413.80	413.77	413.83		
		-.02	-.05	-.19	-.14	-.08	-.11		
	403.98	403.93	403.89	403.86	403.83	403.78	403.94		
		-.05	-.09	-.22	-.15	-.02	-.14		
	393.98	393.85	393.81	393.72	393.64	393.90	393.86		
		-.13	-.08	-.06	-.12	-.08	-.12		
	384.06	383.95	384.01	384.02	383.95	383.99	383.95		
		-.11	-.05	-.04	-.13	-.07	-.11		
	374.04	373.85	374.00	373.82	373.92	373.89	373.93		
		-.19	-.04	-.17	-.12	-.05	-.11		
	364.02	363.85	363.88	363.84	363.80	363.86	363.81		
		-.17	-.14	-.23	-.22	-.06	-.21		
	354.04	353.82	353.82	353.65	353.71	353.70	353.75		
		-.22	-.22	-.56	-.33	-.04	-.29		
	344.07	343.84	343.81	343.77	343.69	343.74	343.71		
		-.23	-.23	-.30	-.38	-.03	-.36		
	334.08	333.95	333.79	333.61	333.67	333.70	333.68		
		-.13	-.29	-.47	-.41	-.03	-.04		
	324.07	324.08	323.93	323.84	323.77	323.81	323.77		
		.01	-.14	-.21	-.30	-.06	-.03		
	324.07	323.11	323.99	323.95	323.86	323.89	323.86		
		.04	-.08	-.86	-.21	-.08	-.21		
	324.05	324.03	324.07	323.97	323.91	323.88	323.93		
		-.02	.02	-.18	-.14	-.07	-.12		
	314.05	313.12	313.10	313.95	313.80	313.89	313.86		
		.07	.05	-.10	-.25	-.06	-.19		
	314.12	314.18	314.27						
		.06	.15						
	304.05	303.10							
		.05							
	304.11	304.14							
		.03							
	294.10	294.06							
		-.04							

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DATA SHEET

Ground Instrumentation - Sondex

Rock Anchor Test - RA3D3

p. 1A of 3

Elevation & Change (Ft)

start RA-I

Date	12 Oct 78	20 Oct 78		INITIAL	25 Dec 78	26 Dec 78	29 Dec 78	23 JAN 79	2 FEB 79	8 FEB 79
Time					60ft	80ft Depth	100ft Depth	114 Ft.	discontinue INDEX 116	6 PM
Top of Casing	421.61	421.62		421.62	421.62	421.62		421.62	421.62	421.62
		+0.01			.00	.00		0.00	0.00	.01
	418.14	418.13		418.14	418.05	418.05	418.06	418.03	418.01	418.05
		- .01			-.09	-.09	-0.08	-0.11	-0.13	-.09
	408.29	408.28		408.28	408.23	408.22	408.22	408.19	408.16	408.20
		0.00			-.05	-.06	-0.06	-0.09	-0.12	-.08
	398.36	398.36		398.36	398.31	398.32	398.32	398.28	398.26	398.28
		0.00			-.05	-.04	-0.04	-0.08	-0.10	-.03
	388.69	388.67		388.65	388.63	388.63	388.63	388.60	388.59	388.60
		-0.01			-.05	-.05	-0.05	-0.08	-0.09	-.03
	378.81	378.79		378.80	378.76	378.73	378.77	378.74	378.72	378.73
		-0.02			-.04	-.03	-0.03	-0.06	-0.08	-.03
	373.16	373.16		373.16	373.11	373.11	373.12	373.08	373.06	373.00
		0.00			-.05	-.05	-0.04	-0.08	-0.10	-.03
	369.74	369.75		369.75	369.69	369.69	369.70	369.66	369.65	369.64
		+0.01			-.06	-.06	-0.05	-0.09	-.10	-.11
	365.49	365.50		365.50	365.45	365.45	365.45	365.41	365.39	365.42
		+0.01			-.05	-.05	-0.05	-0.09	-0.11	-.03
	356.40	356.40		356.40	356.35		356.35	356.32	356.28	356.32
		0.00			-.05		-0.05	-0.08	-0.12	-.03
	353.68	353.58		353.63	353.62		353.62	353.60	353.58	353.61
		-0.10			-.01		-0.01	-0.03	-.05	-.02
	350.48	350.47		350.48	350.43		350.43	350.40	350.37	350.42
		-0.01			-.05		-0.05	-0.08	-0.11	-.06
	346.44	346.43		346.44	346.39		346.38	346.35	346.33	346.35
		-0.01			-.05		-0.06	-0.09	-0.11	-.06

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DATA SHEET

Ground Instrumentation - Sondex

Rock Anchor Test - RA 3D3

p. 1B of 3

Elevation & Change (Ft)

start RA-I

Date	12 Oct 78	20 Oct 78	INITIAL	28 DEC 78	29 DEC 78	23 JAN 79	28 FEB 79	
Time						114 Ft.	discontinue over 115	
Top of								
Casing	421.61	421.62	421.62	421.62	421.62	421.62		
	335.52	335.53	335.53	335.47	*	335.44	335.43	335.48
		+0.01		-0.06		-0.09	-0.10	-0.05
	331.76	331.77	331.77	331.72		331.69	331.65	331.74
		+0.01		-0.05		-0.07	-0.04	-0.03
	328.00	328.01	328.01	327.96			327.90	327.96
		+0.01		-0.05			-0.11	-0.05
	323.52	323.51	323.52	323.47			323.40	323.49
		-0.01		-0.05			-0.12	-0.03
	313.69	313.69	313.69	313.62				313.63
		0.00		-0.07				-0.06

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DATA SHEET

GROUND INSTRUMENTATION - Sondex

Rock Anchor Test-RA303

p. 2A of 3

Elevation & Change (Ft)

	complete RA-12	start RA-12	complete RA-12	start RA-12	complete RA-12	start RA-12	complete RA-12	start RA-12	complete RA-12
DATE	INITIAL	9 Feb 79	17 Feb 79	17 Feb 79	18 Feb 79	19 Feb 79	24 Feb 79	25 Feb 79	24 Feb 79
TIME			100 ft	125 ft	150 (40) ft	175 ft	120 ft	176 ft	150 ft
TYPE OF			RA12	RA12	RA12	RA12	RE-1	RE-1	RE-1
CASING	421.62	421.62	421.62			421.62	421.59	421.59	421.59
							-.03	-.03	-.03
	418.14	418.01	418.02	418.02	418.02	418.01	417.97	417.93	417.92
		-.13		-.012	-.012	-.012	-.013	-.17	-.15
	408.28	408.18	408.18	408.18	408.18	408.17	408.13	408.13	408.05
		-.10		-.010	-.010	-.010	-.011	-.14	-.20
	398.36	398.26	398.26	398.26	398.26	398.26	398.22	398.22	398.12
		-.10		-.010	-.010	-.010	-.010	-.14	-.19
	388.68	388.58	388.58	388.59	388.58	388.58	388.53	388.54	388.56
		-.10		-.010	-.009	-.010	-.010	-.15	-.12
	378.80	378.73	378.72	378.72	378.72	378.71	378.66	378.66	378.63
		-.07		-.008	-.008	-.008	-.009	-.14	-.12
	373.16	373.06	373.06	373.06	373.04	373.06	373.00	372.99	373.01
		-.10		-.010	-.010	-.012	-.010	-.16	-.15
	369.35	369.25	369.26	369.23	369.22	369.24	369.17	369.16	369.19
		-.10		-.011	-.012	-.013	-.011	-.18	-.16
				-.009					
	365.50	365.40	365.40	365.40	365.38	365.39	365.33	365.32	365.22
		-.10		-.010	-.010	-.012	-.011	-.17	-.13
	356.40	356.31	356.34	356.32	356.32	356.33	356.25	356.24	356.26
		-.09		-.006	-.008	-.008	-.007	-.15	-.14
	353.63	353.59	353.62	353.60	353.60	353.63	353.54	353.53	353.52
		-.04		-.001	-.003	-.003	0.00	-.09	-.06
	350.48	350.41	350.44	350.44	350.44	350.47	350.39	350.39	350.39
		-.07		-.004	-.004	-.004	-.001	-.09	-.09
	346.44	346.35		346.41	346.42	346.43	346.39	346.39	346.33
		-.09		-.003	-.002	-.001	-.05	-.05	-.11

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DATA SHEET

GROUND INSTRUMENTATION - Sondex

Rock Anchor Test - RA 903

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		Elevation & Change (ft)		complete		start	complete
		complete	start	RA-I2	RA-I2	RE-1	RE-1
DATE	INITIAL	9 Feb 79		17 Feb 79	18 Feb 79	19 Feb 79	24 Feb 79
TIME				125 ft	180 (mult)	179 ft	120 ft
TOR OF				RAI2	RAI2	RAI2	REI
CASING	421.62	421.62					
	335.53	335.48		335.53	335.53	335.56	335.52
		-0.05		0.00	0.00	+0.03	-0.01
	331.77	331.72		331.76	331.76	331.8	331.77
		-0.05		-0.01	-0.01	+0.03	0.00
	328.01	327.96		328.00	328.02	328.03	328.01
		-0.05		-0.01	+0.01	+0.02	0
	323.52	323.48		323.52	323.52	323.54	323.52
		-0.04		0.00	0.00	+0.02	0
	313.69	313.64			313.68	313.7	313.68
		-0.05			-0.01	+0.01	-0.01

C-29



Woodward-Clyde Consultants

Consulting Engineers,
Geologists and Environmental Scientists

DATA SHEET

Ground Instrumentation - Sondex

Rock Anchor Test - RA3D3

p. 3 of 3

Elevation & Change (ft)

complete
RE-2

Date	Initial	1 March 79	2 March 79	7 March 79	16 March 79	6 March 79	8 March 79			
Depth		119 ft	144 ft	176 ft						
No.		RE 2	RE 2							
Top of Casing	421.62	421.59	421.59	421.54	421.54	421.54	421.54			
		-.03	-.02	-.05	-.03		-.05			
	418.14	417.92	418.00	417.87	417.91	417.89	417.94			
		-.12	-.14	-.23	-.23	-0.25	-0.30			
	408.28	408.13	408.14	408.07	408.07	408.04	408.10			
		-.15	-.14	-.25	-.21	-0.24	-0.16			
	398.36	398.22	398.23	398.12	398.12	398.20	398.18			
		-.14	-.13	-.23	-.19	-0.16	-0.18			
	388.68	388.53	388.54	388.55	388.47	388.51	388.50			
		-.15	-.14	-.12	-.21	-0.17	-0.18			
	378.80	378.64	378.65	378.55	378.58	378.61	378.59			
		-.16	-.15	-.25	-.22	-0.19	-0.21			
	372.16	372.15	372.15	372.15	372.87	372.91	372.90			
		-.21	-.21	-.31	-.29	-0.25	-0.26			
	369.75	369.51	369.50	369.39	369.42	369.46	369.45			
		-.24	-.25	-.36	-.33	-0.29	-0.30			
	365.50	365.25	365.23	365.23	365.15	365.14	365.18			
		-.25	-.23	-.27	-.35	-0.36	-0.32			
	356.40	356.18	356.11	356.01	356.03	356.06	356.06			
		-.22	-.29	-.59	-.37	-0.34	-0.34			
	353.63	353.47	353.42	353.53	353.54	353.37	353.36			
		-.16	-.21	-.30	-.29	-0.26	-0.27			
	350.48	350.34	350.29	350.28	350.20	350.23	350.23			
		-.14	-.19	-.20	-.28	-0.25	-0.25			
	346.44	346.36	346.33	346.32	346.29	346.22	346.27			
		-.08	-.11	-.12	-.20	-0.22	-0.17			
	339.53	339.56	339.55	339.53	339.47	339.45	339.51			
		.03	.02	.02	-.06	-0.08	-0.02			
	331.77	331.79	331.81	331.94	331.71	331.74	331.77			
		.02	.04	-.03	-.06	-0.03	0.00			
	328.01		328.05	328.04	327.99	327.95	328.01			
			.04	.03	-.02	-.06	0.00			
	323.52		323.56	323.47	323.47	323.49	323.52			
			.04	-.05	-.05	-0.03	0.00			
	313.69		313.72	313.62	313.66	313.69	313.69			
			.03	-.07	-.03	0.00	-0.02			

PHASE IV REPORT

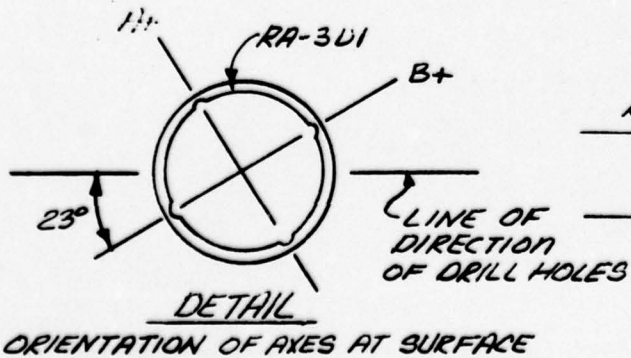
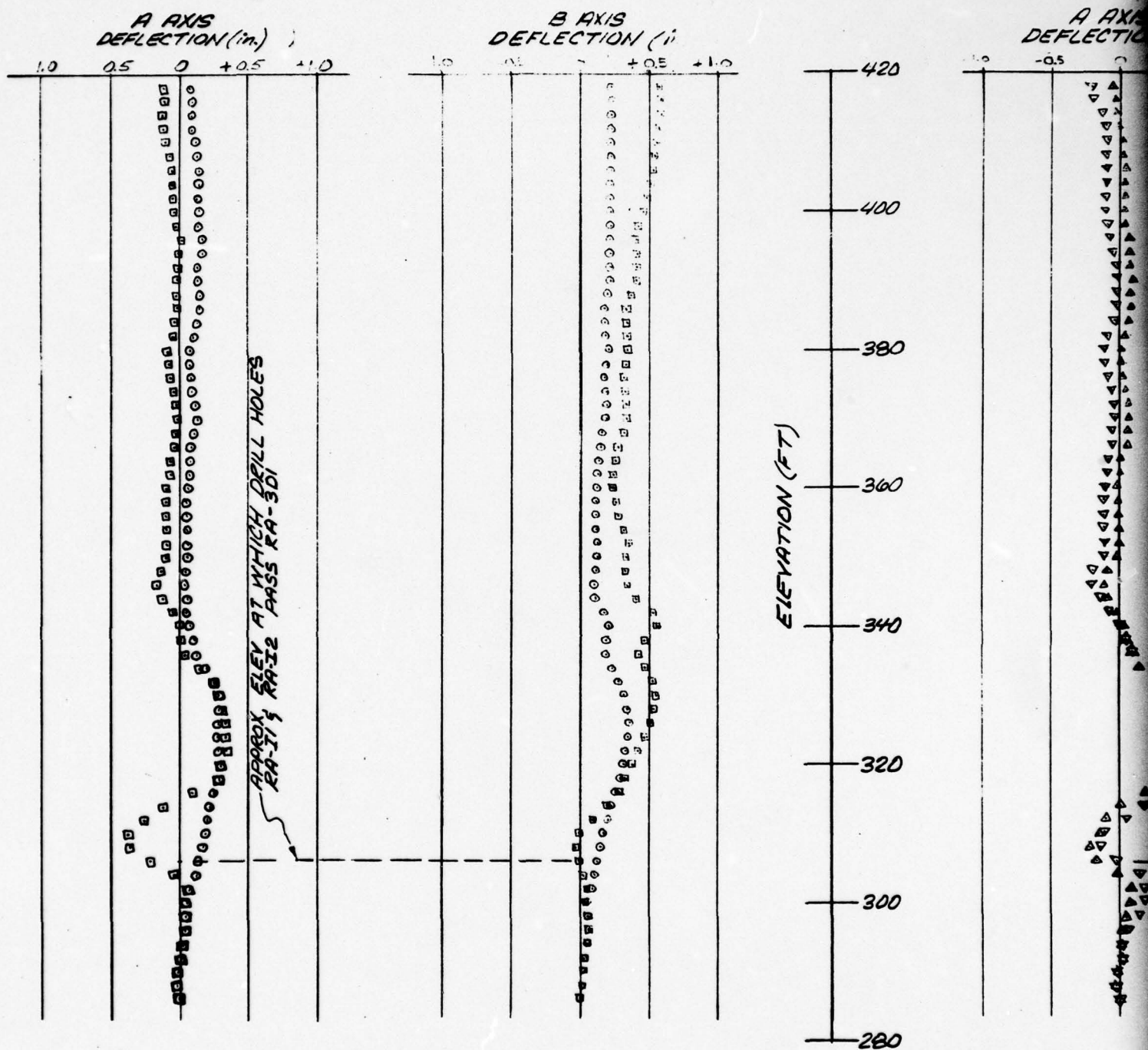
VOLUME VA

**RESULTS AND INTERPRETATION OF
ROCK ANCHOR TEST PROGRAM**

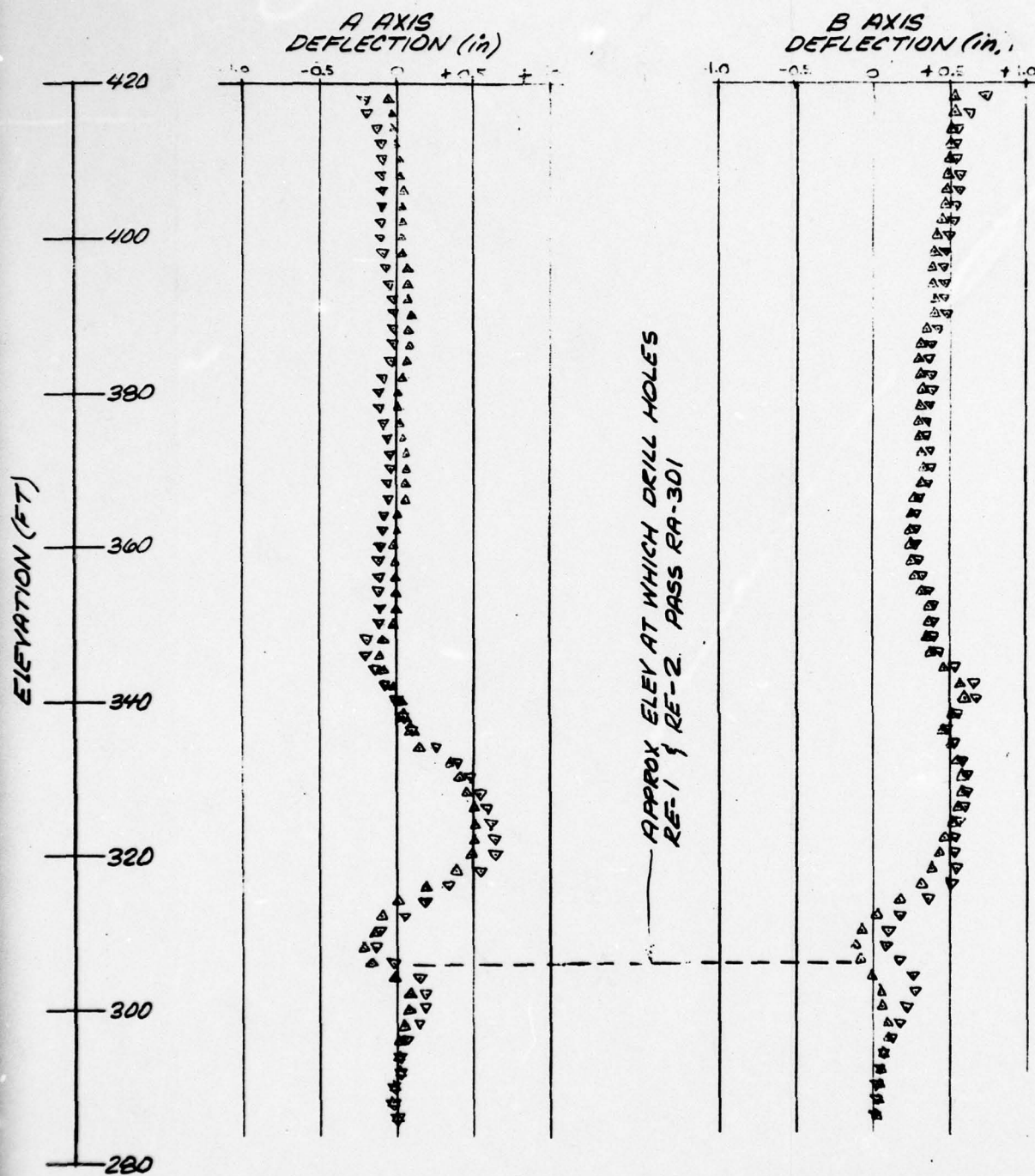
**APPENDIX D
INCLINOMETER PROFILES**

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Figure D.2	INCLINOMETER PROFILES AFTER DRILLING, RA-3D2
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Figure D.4	SPIRAL MEASUREMENTS; INCLINOMETER AXIS ORIENTATION AT DEPTH, RA-3D1
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LOCATION PLAN



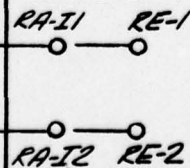
LEGEND

- AFTER DRILLING RA-1
- AFTER DRILLING RA-2
- △ AFTER DRILLING RE-1
- ▽ AFTER DRILLING RE-2

RA 303

OF AXES AT SURFACE, SEE DETAIL
AT DEPTH, SEE FIG D.4

LOCATION PLAN



ROCK ANCHOR TEST PROGRAM INCLINOMETER PROFILES AFTER DRILLING

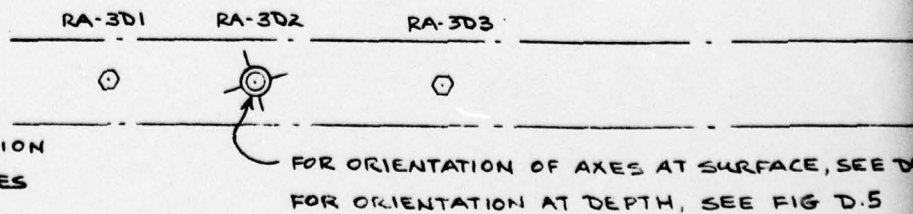
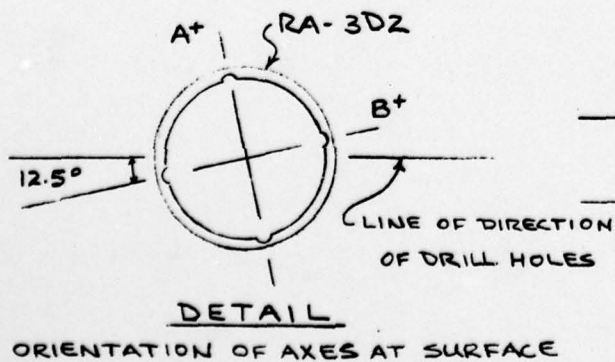
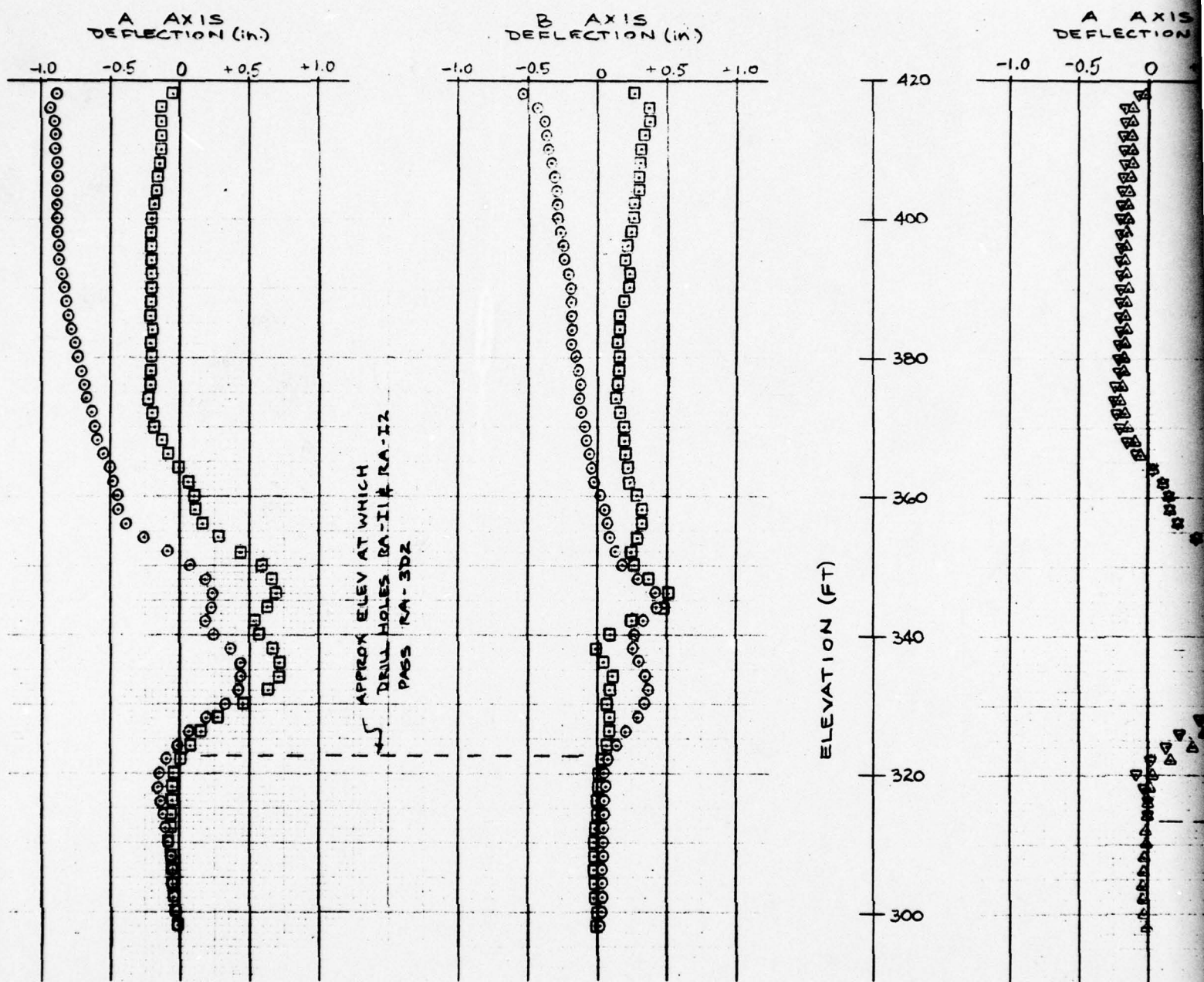
RA 301

FOUNDATION INVESTIGATION AND TEST PROGRAM
EXISTING LOCKS AND DAM No. 28
ST LOUIS DISTRICT, CORPS OF ENGINEERS.
DACW43-78-C-0005

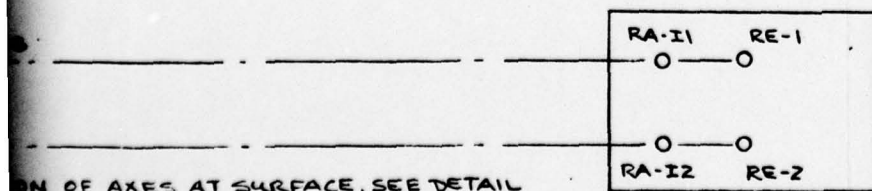
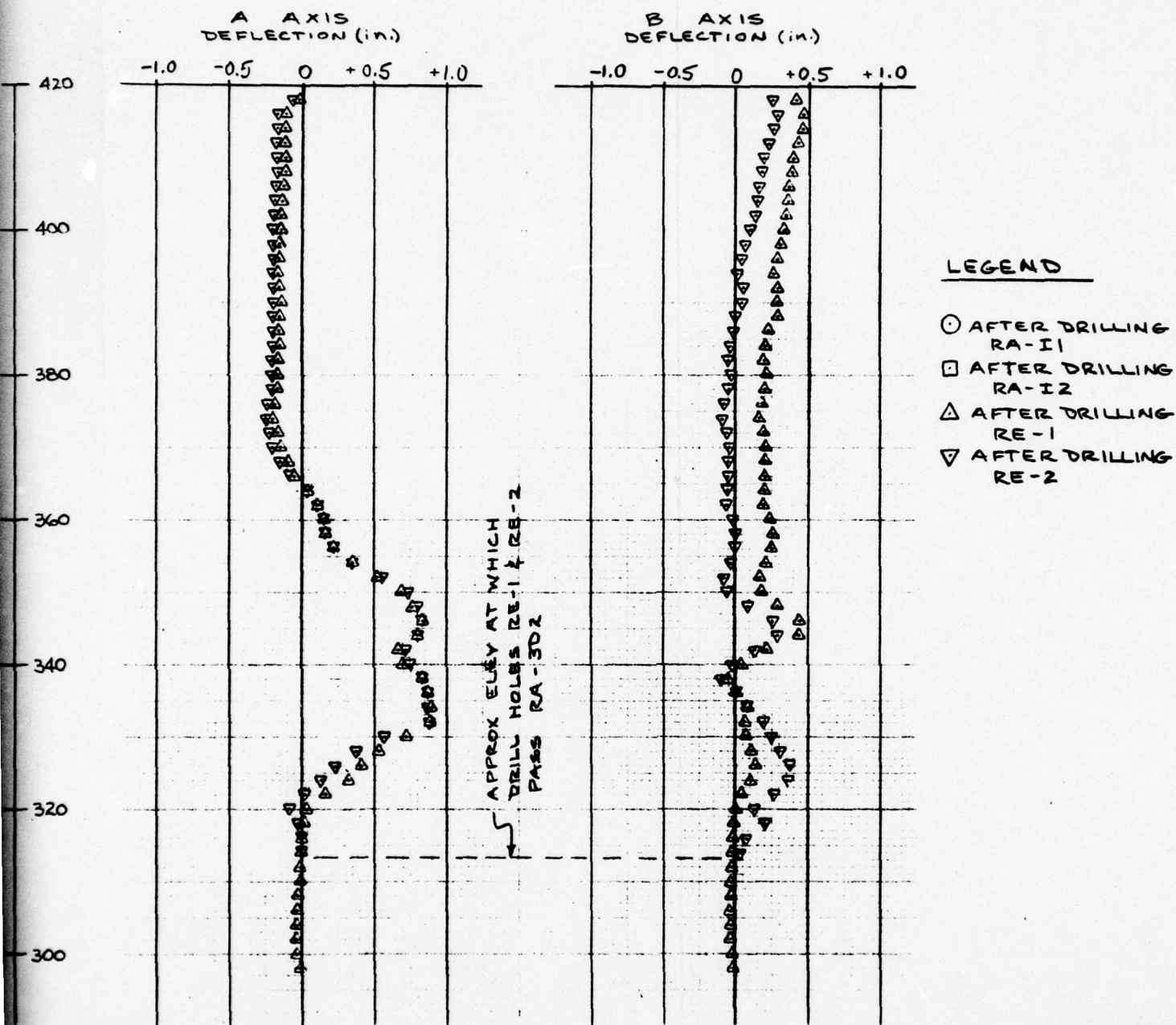
Woodward-Clyde Consultants
VTC825 Phase II

Fig D.1

2



LOCATION P



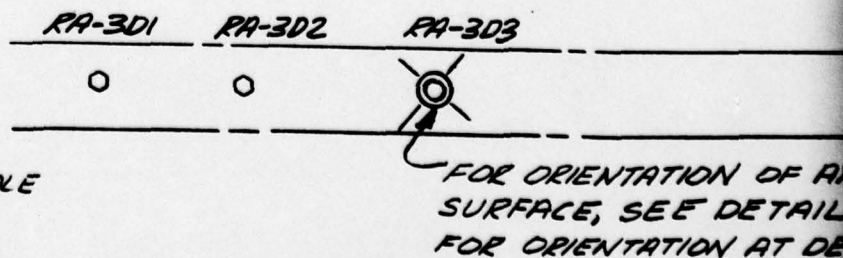
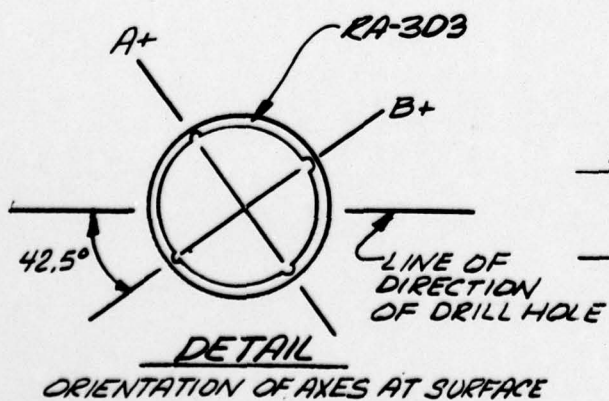
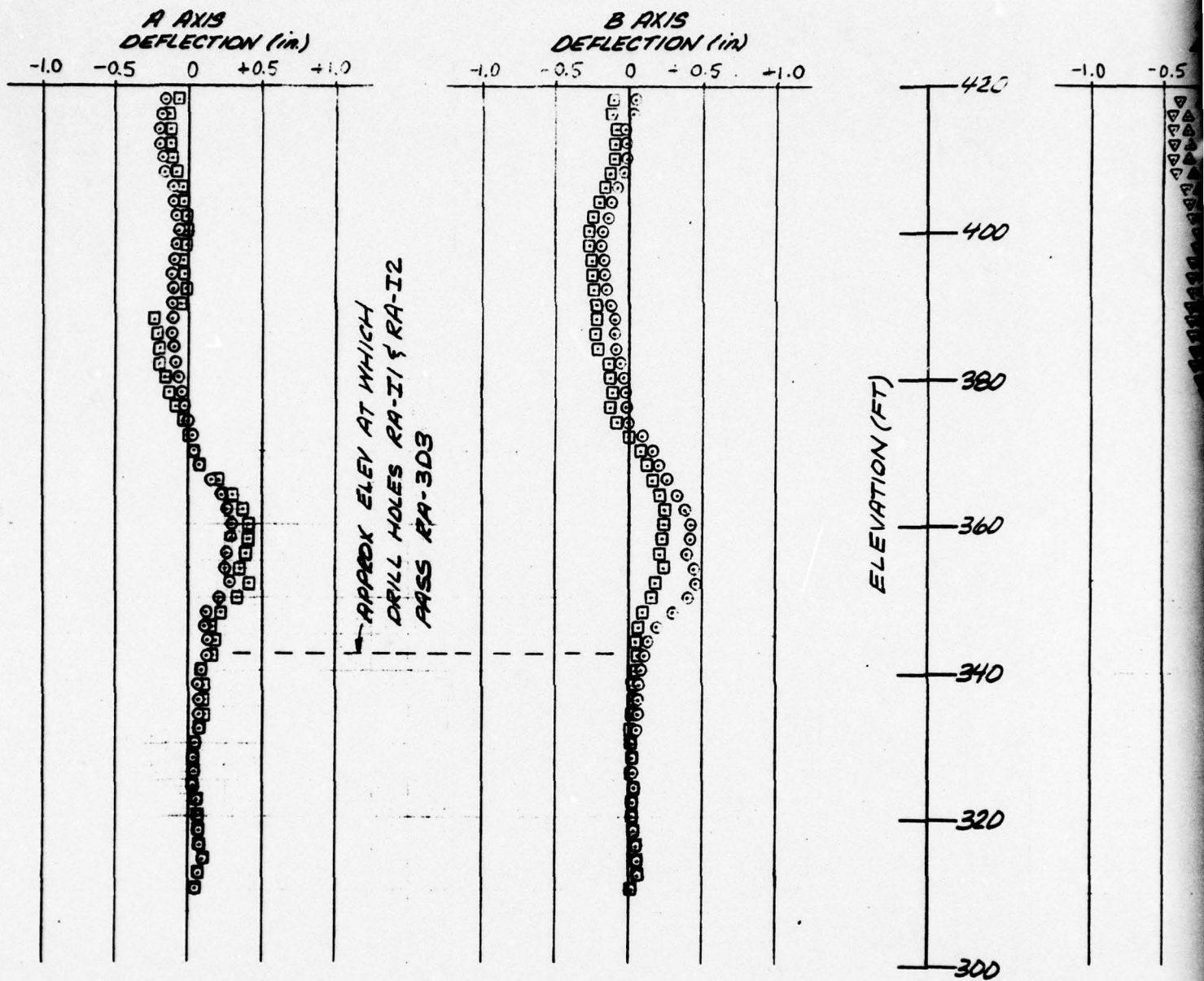
ROCK ANCHOR TEST PROGRAM
INCLINOMETER PROFILES
AFTER DRILLING

RA-302

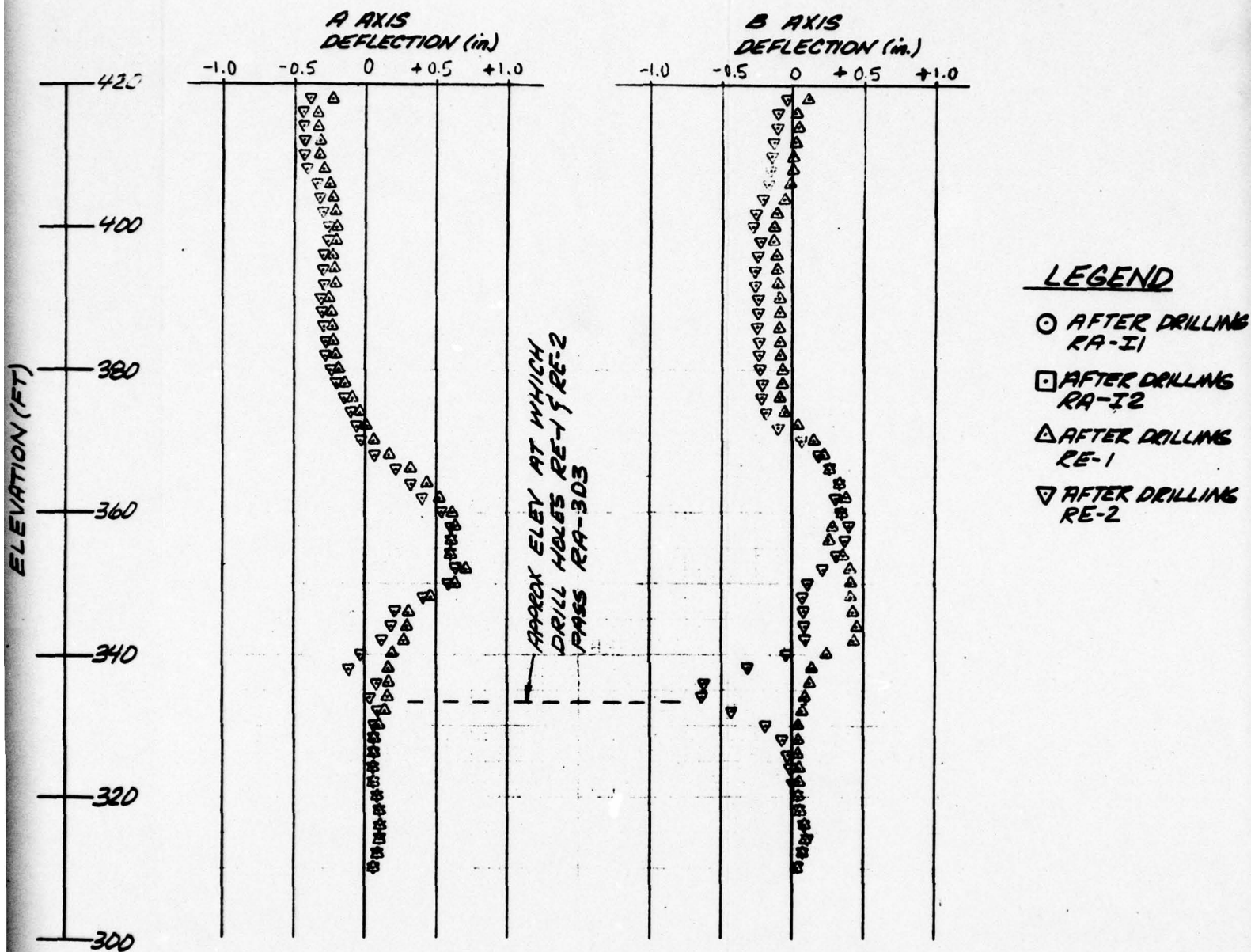
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EXISTING LOCKS AND DAM No. 26
ST LOUIS DISTRICT, CORPS OF ENGINEERS.
DACW43-78-C-8008

Woodward-Clyde Consultants
YTC825 Phase II

Fig D.2



1



RA-303

RA-I RE-1

RA-I2 RE-2

FOR ORIENTATION OF AXES AT
SURFACE, SEE DETAIL
FOR ORIENTATION AT DEPTH, SEE FIG D.6

LOCATION PLAN

ROCK ANCHOR TEST PROGRAM
INCLINOMETER PROFILES
AFTER DRILLING

RA 303

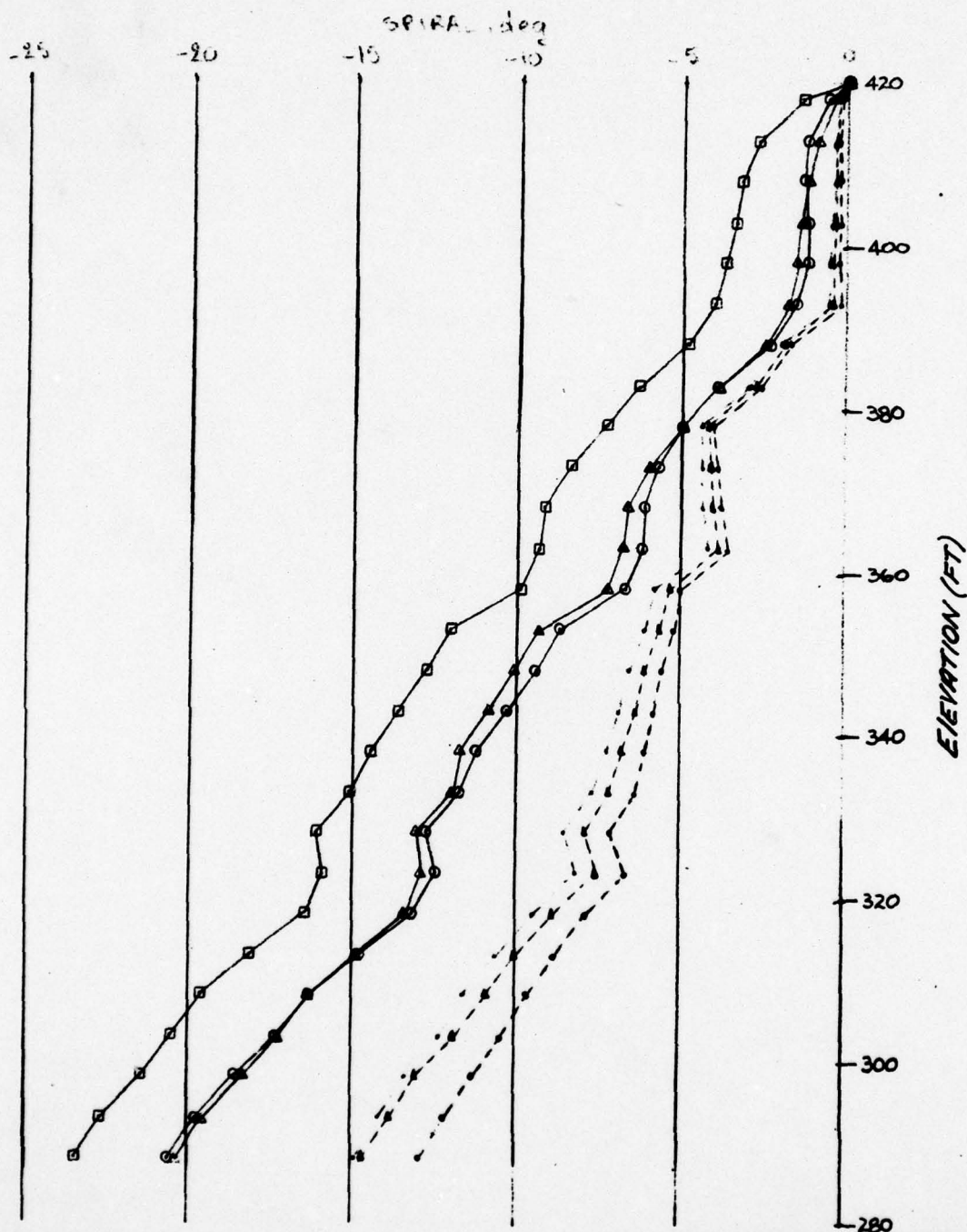
FOUNDATION INVESTIGATION AND TEST PROGRAM
EXISTING LOCKS AND DAM No. 26
ST LOUIS DISTRICT, CORPS OF ENGINEERS.
DACW43-78-C-9905



Woodward-Clyde Consultants

VTCS25 Phase II

Fig. D.3



Legend:

- Torpedo lowered down the casing
- Torpedo pulled up the casing

Notes:

Positive measurement indicates clockwise rotation
Measurements made in A groove

**ROCK ANCHOR TEST PROGRAM
SPIRAL MEASUREMENTS;
INCLINOMETER AXIS
ORIENTATION AT DEPTH
RA 3D1**

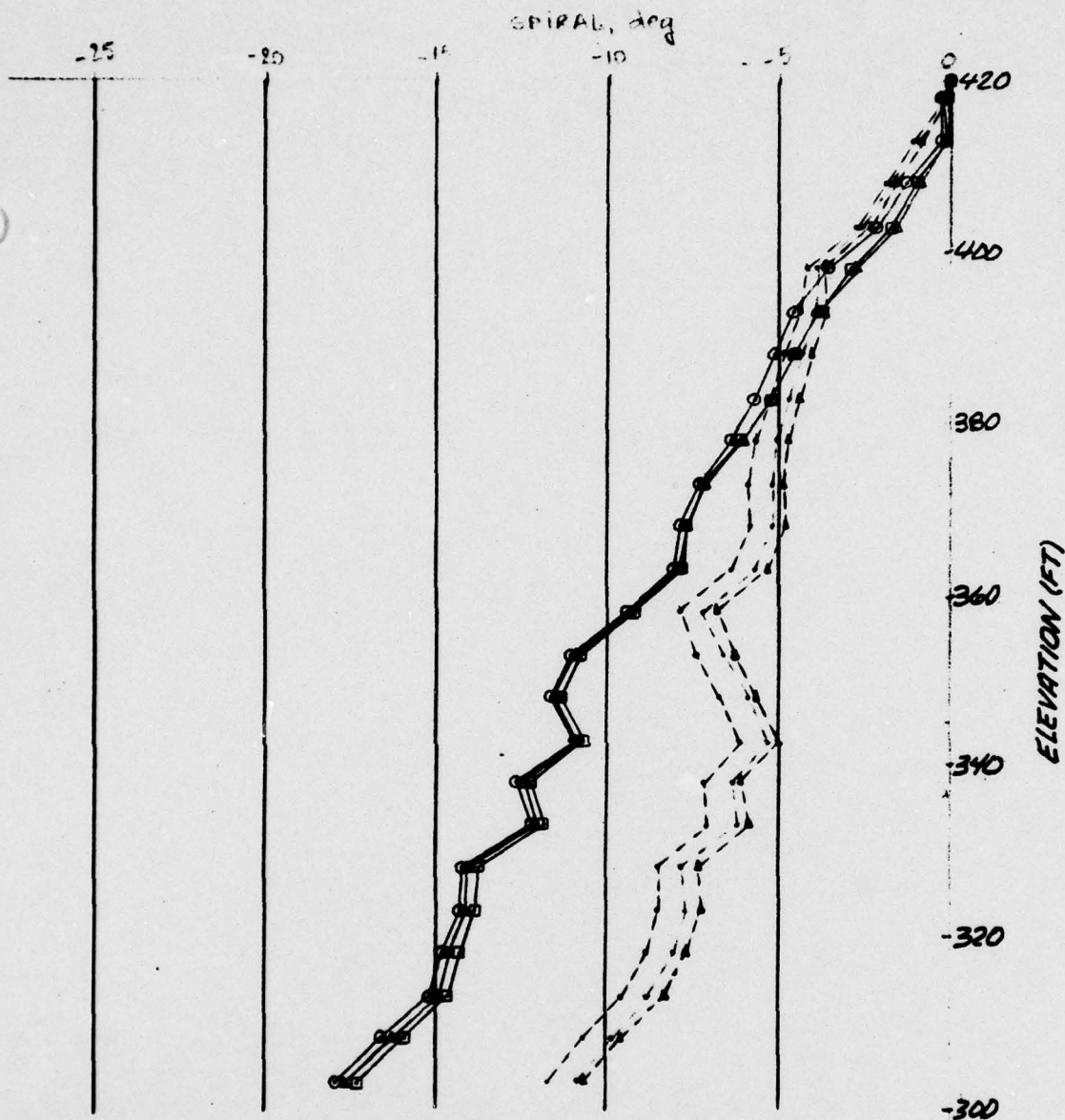
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EXISTING LOCKS AND DAM No. 26
ST LOUIS DISTRICT, CORPS OF ENGINEERS.
DACW43-78-C-0005



Woodward-Clyde Consultants

VT0225 Phase III

Fig. D.4



Legend:

- Torpedo lowered down the casing
- Torpedo pulled up the casing

Notes:

Positive measurement indicates clockwise rotation
 Measurements made in A⁺ groove

ROCK ANCHOR TEST PROGRAM
SPIRAL MEASUREMENTS;
INCLINOMETER AXIS
ORIENTATION AT DEPTH
RA-3D2

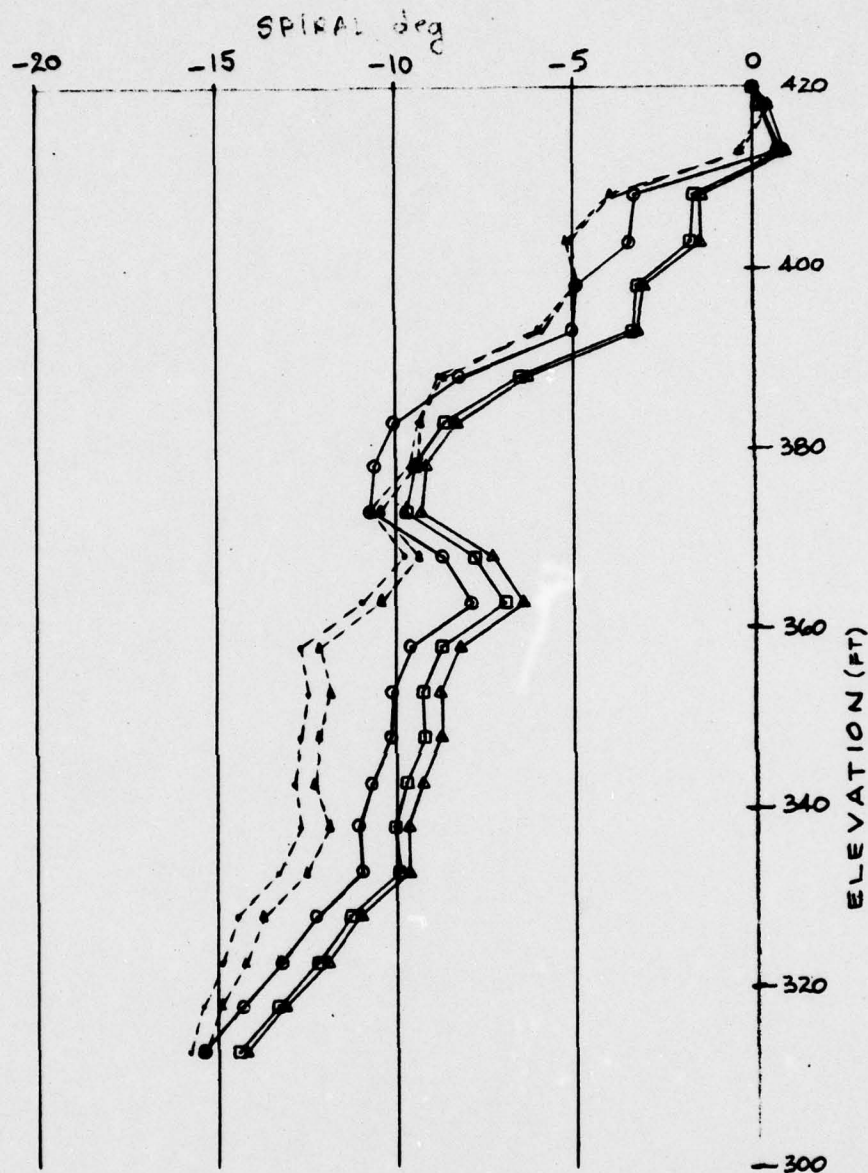
FOUNDATION INVESTIGATION AND TEST PROGRAM
 EXISTING LOCKS AND DAM NO. 26
 ST. LOUIS DISTRICT, CORPS OF ENGINEERS.
 DACW43-78-C-0005



Woodward-Clyde Consultants

Y7C825 Phase II

Fig 0.5



Legend:

- Torpedo lowered down the casing
- Torpedo pulled up the casing

Notes:

Positive measurement indicates clockwise rotation
Measurements made in A+ groove

**ROCK ANCHOR TEST PROGRAM
SPIRAL MEASUREMENTS;
INCLINOMETER AXIS
ORIENTATION AT DEPTH
RA-303**

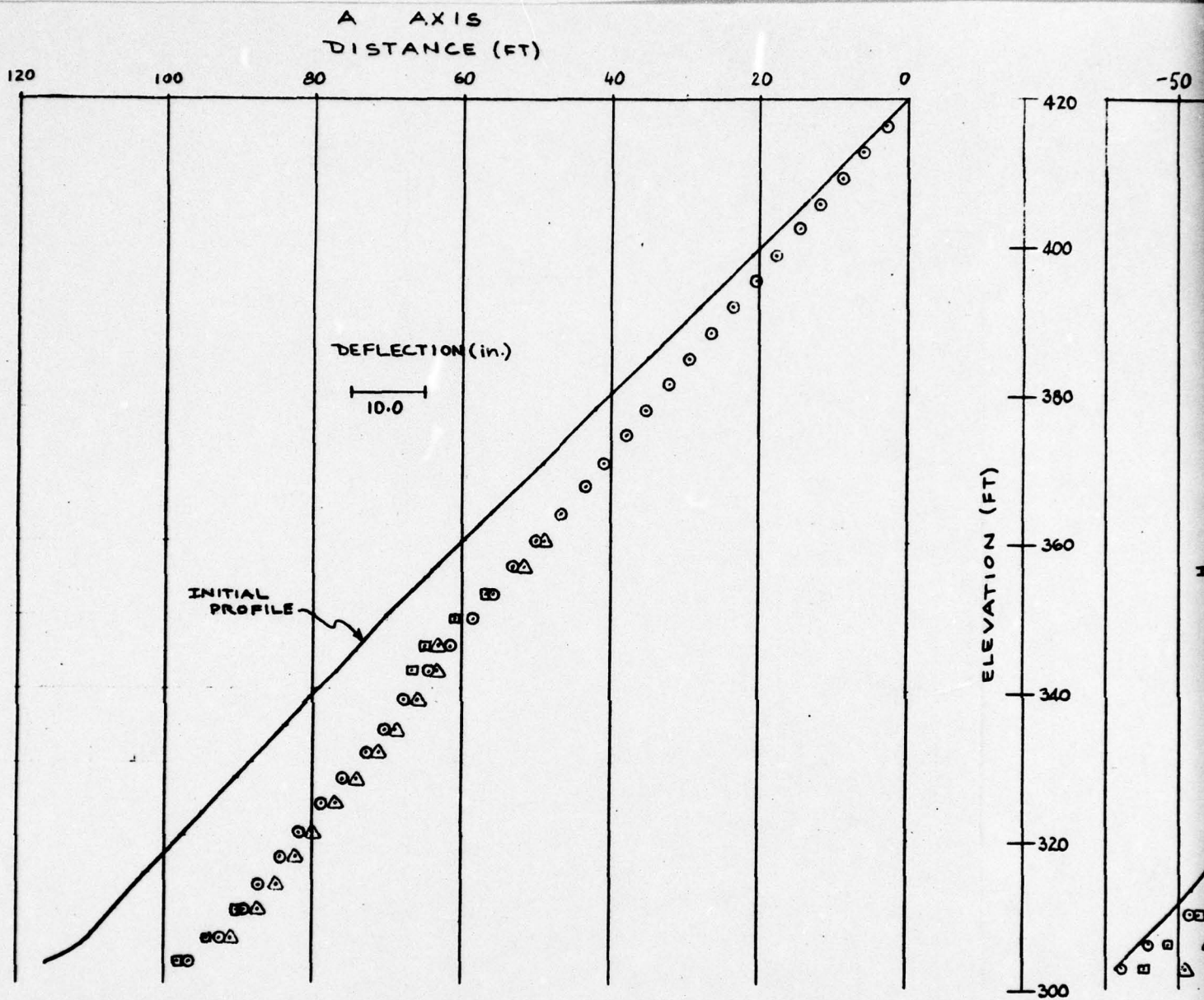
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EXISTING LOCKS AND DAM No. 26
ST LOUIS DISTRICT, CORPS OF ENGINEERS.
DACW43-75-C-0005



Woodward-Clyde Consultants

Y7C625 Phase II

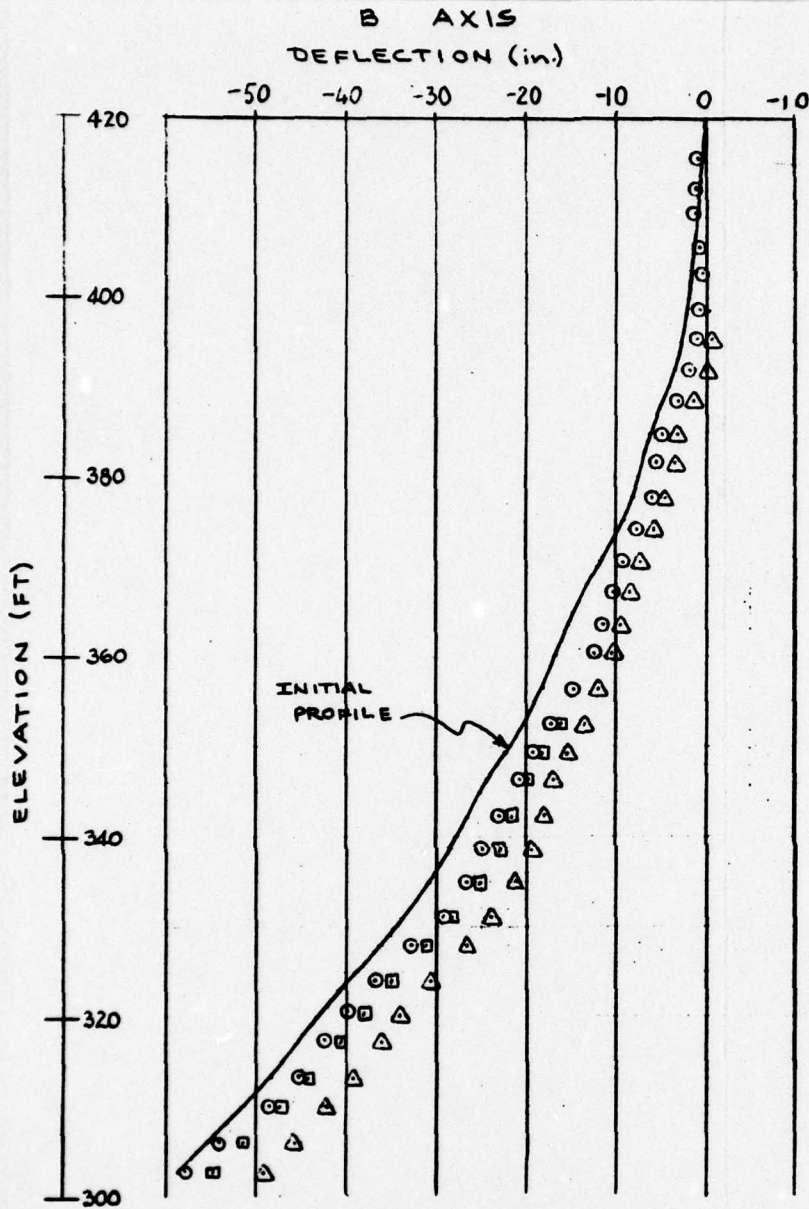
Fig. D6



A

LOCATION PLAN

1

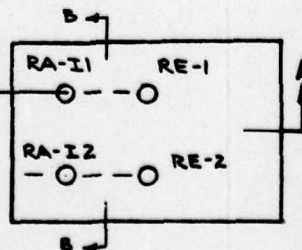


LEGEND

- AFTER DRILLING RA-I2
- AFTER DRILLING RE-1
- △ AFTER DRILLING RE-2

SECTION B-B

LOCATION PLAN



ROCK ANCHOR TEST PROGRAM
INCLINED INCLINOMETER PROFILES
AFTER DRILLING

RA-I1

FOUNDATION INVESTIGATION AND TEST PROGRAM
EXISTING LOCKS AND DAM No. 26
ST LOUIS DISTRICT, CORPS OF ENGINEERS.
DACW43-78-C-9995


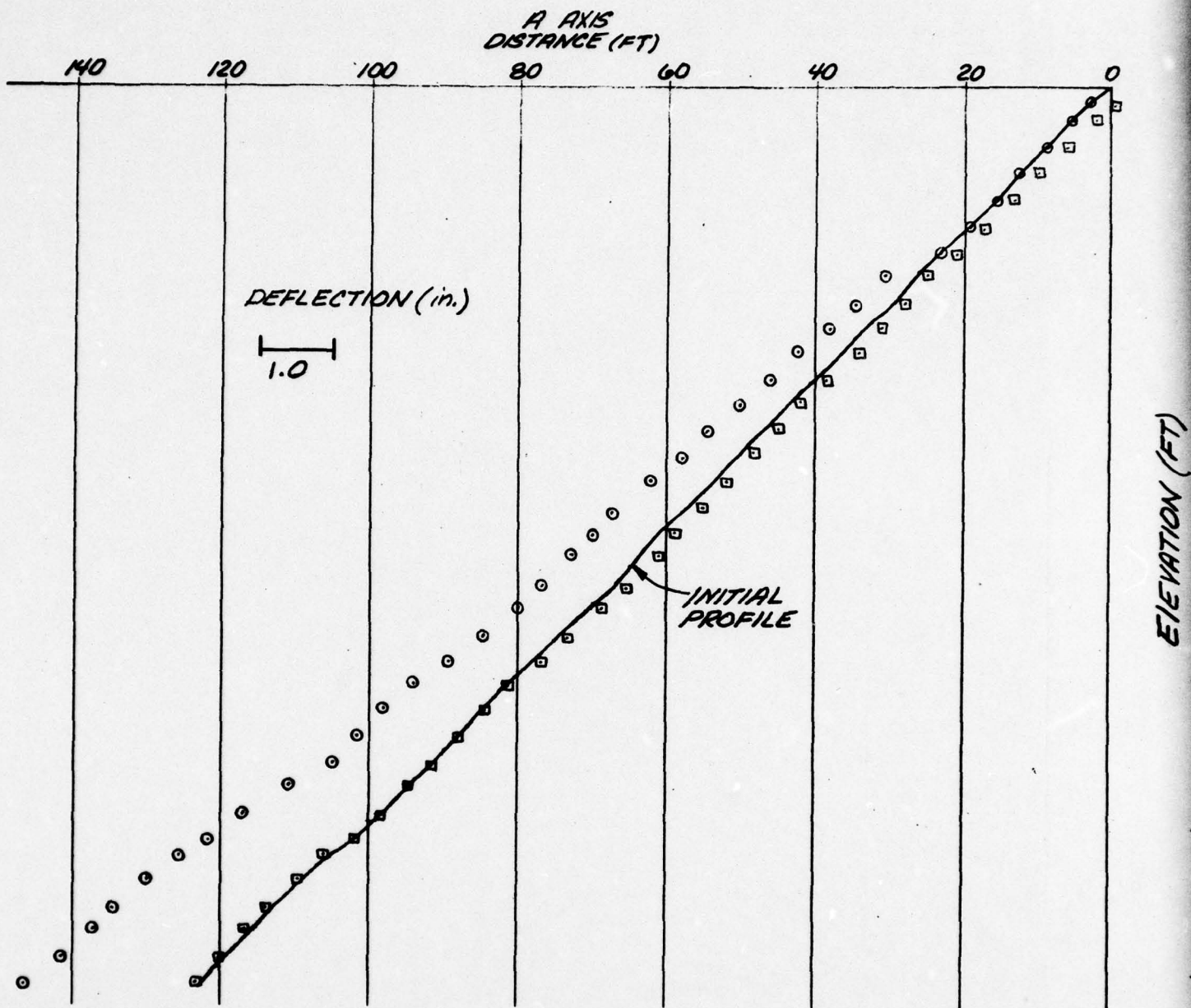
 **Woodward-Clyde Consultants**
V7C825 Phase II

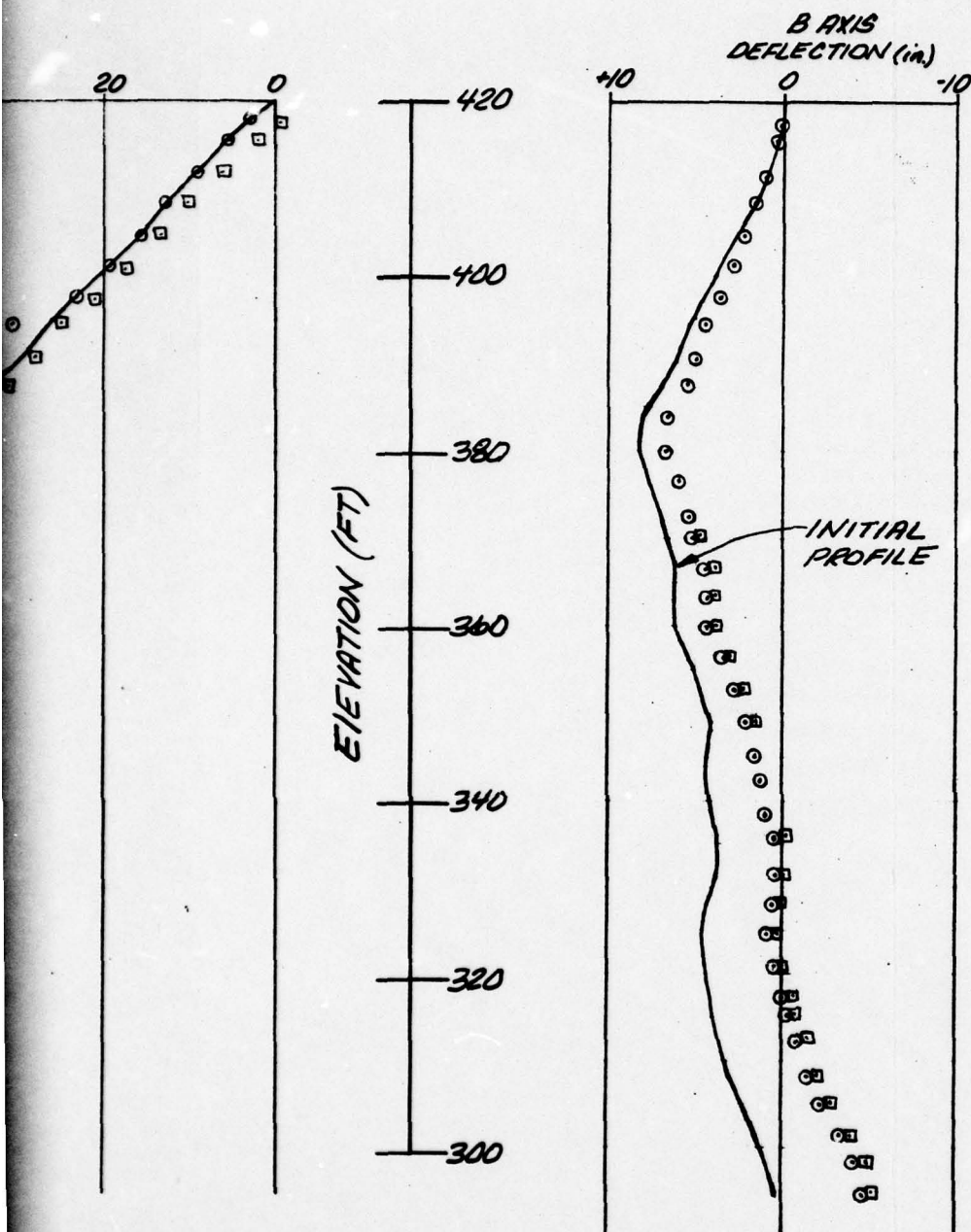
Fig. D.7



SECTION A-A

A

LOCATION P

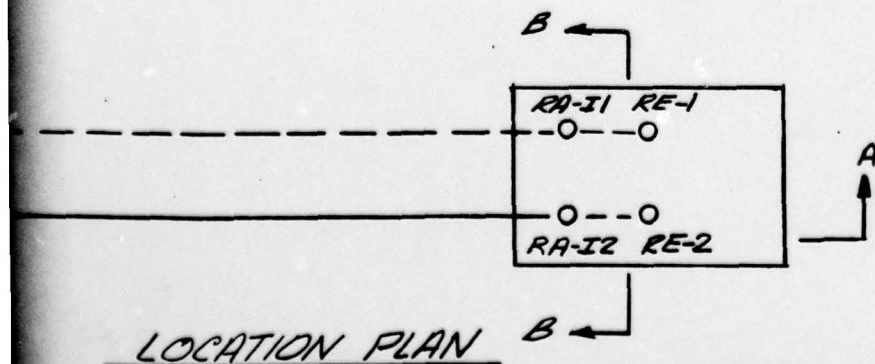


LEGEND

○ AFTER DRILLING
RE-1

□ AFTER DRILLING
RE-2

SECTION B-B



ROCK ANCHOR TEST PROGRAM INCLINED INCLINOMETER PROFILES AFTER DRILLING

RA-I2

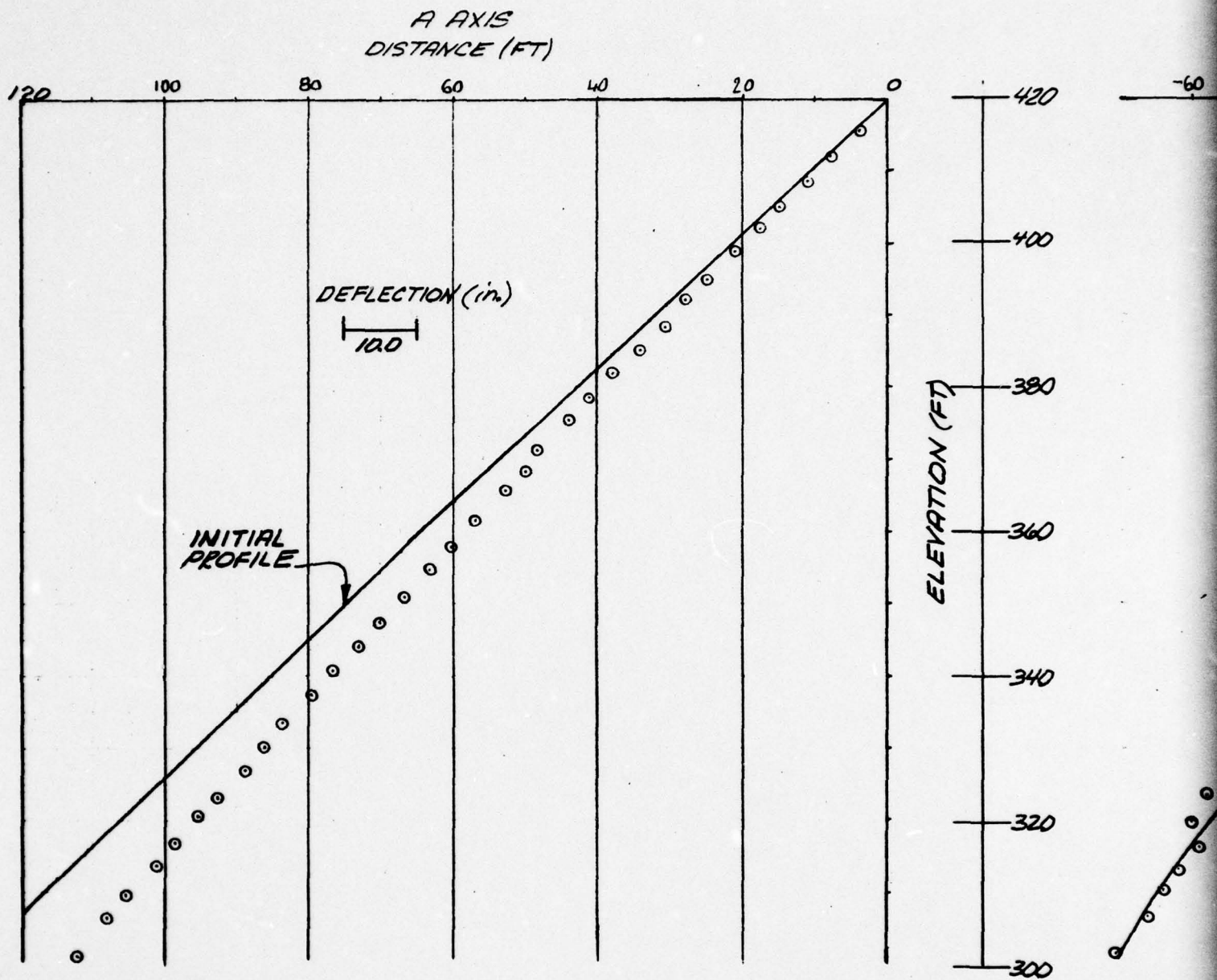
FOUNDATION INVESTIGATION AND TEST PROGRAM
EXISTING LOCKS AND DAM No. 26
ST LOUIS DISTRICT, CORPS OF ENGINEERS.
DACW43-76-C-0005



Woodward-Clyde Consultants

V70856 Photo 12

Fig. D.8

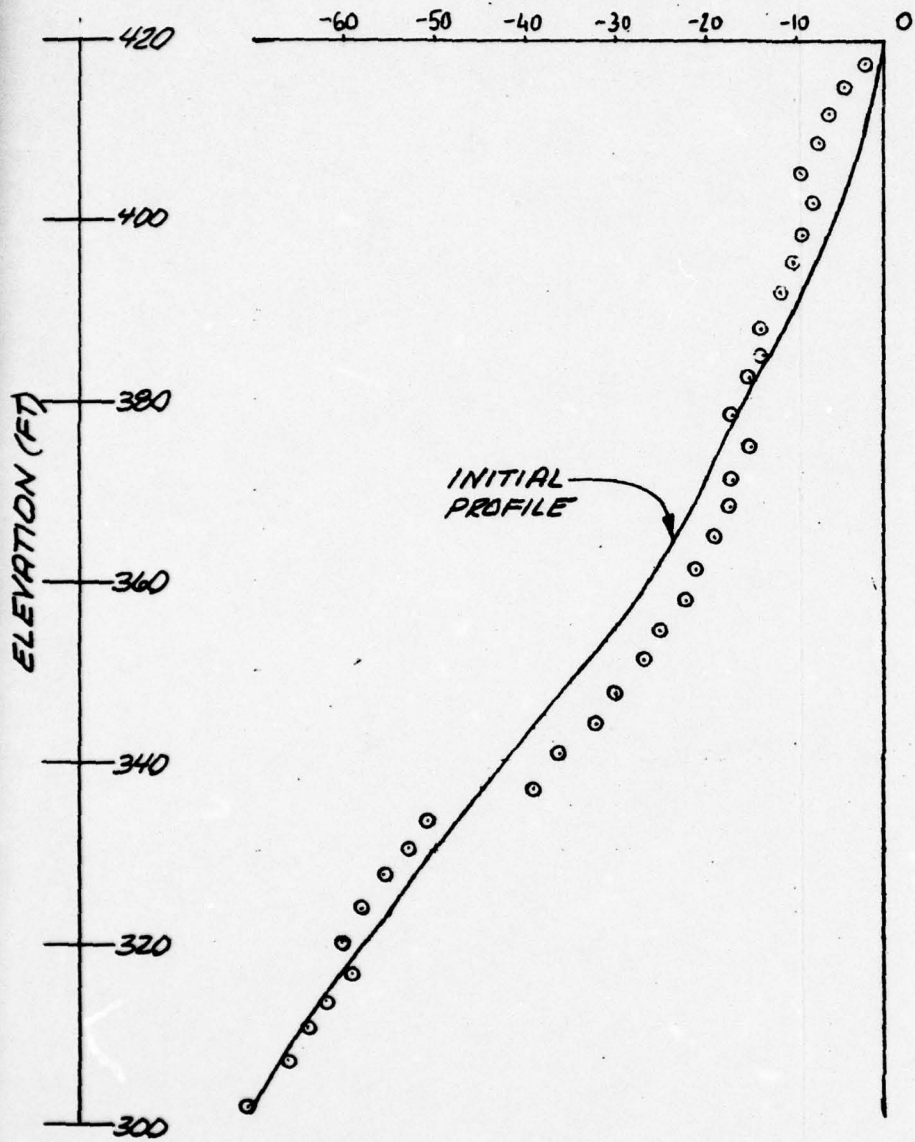


SECTION A-A



LOCATION PLAN

**B AXIS
DEFLECTION (in.)**

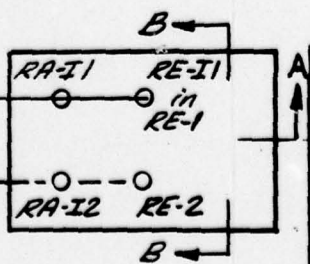


LEGEND

○ AFTER DRILLING
RE-2

SECTION B-B

LOCATION PLAN



ROCK ANCHOR TEST PROGRAM <u>INCLINED INCLINOMETER PROFILES</u> <u>AFTER DRILLING</u>	
RE-I1	
<small>FOUNDATION INVESTIGATION AND TEST PROGRAM EXISTING LOCKS AND DAM No. 26 ST LOUIS DISTRICT, CORPS OF ENGINEERS. DAGW43-78-C-0005</small>	
Woodward-Clyde Consultants <small>Y7C025 Phase II</small>	Fig. D.9

2

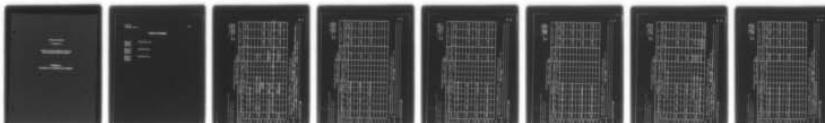
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RESULTS AND INTERPRETATION OF ROCK ANCHOR TEST PROGRAM. EXISTIN--ETC(U)
JUL 79 J PEREZ , R A FASANO
DACW43-78-C-0005

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PHASE IV REPORT

VOLUME VA

**RESULTS AND INTERPRETATION OF
ROCK ANCHOR TEST PROGRAM**

APPENDIX E

QUANTITY OF CUTTINGS DATA SHEETS

TABLE OF CONTENTS

Page E-1 through Page E-2	Drill Hole RA-I2
Page E-3 through Page E-4	Drill Hole RE-1
Page E-5 through Page E-6	Drill Hole RE-2

WOODWARD-CLYDE CONSULTANTS
LOCK AND DAM NO. 26
ROCK ANCHOR TEST

P. 1 of 2
Date 16/17 May
By RQ & LI

MEASUREMENT OF CUTTINGS
TEST DRILL HOLE NO RA-I-2

DRILLED DEPTH ft.	DRY DENSITY lb/ft ³	WEIGHT, lb						WATER CONTENT			VOLUME, FT ³		
		Cuttings Bin	Bin	Est. Loss	Cuttings		Fines Bag	Bag	Fines		Measured (1)	Theoretical (2)	Variation M/F
					Wet	Dry			Cuttings	Fines			
0													
46.0	clay	no measurements											
46.0		269	0	0	269	233	none			20.3			
71.0	105.0	3563	0	0	3563	3311	bin			7.6			
						3534					33.66	9.85	3.42
71.0													
96.1	105.0	9015	520	0	8495	7387			estimate ① 15.0		70.35	9.91	7.10
		[at approx depth 20 ft, estimate +2000 lb expelled during drilling interruption]											
96.1													
121.1	105.0				② 5750	5000			estimate ① 15.0		47.6	9.85	4.83

Notes. 1) Measured Volume (ft³) = (Dry wt. Cuttings + Dry wt. Fines) / Dry Density.
2) Theoretical Volume (ft³) = $\pi (0.5 \text{ in.})^2 (L) = 0.394 \text{ ft}^2 \times L \text{ (ft)}$
Remarks. ① material was frozen in the bin ② weight estimated; material was frozen in the bin
no water content taken

WOODWARD-CLYDE CONSULTANTS
 LOCKS AND DAM NO. 26
 ROCK ANCHOR TEST

P. 2 of 2
 Date 18 to 20 Mar
 By LI + RQ

MEASUREMENT OF CUTTINGS
 TEST DRILL HOLE NO RA-I-2

DRILLED DEPTH ft.	DRY DENSITY lb/cft3	WEIGHT, lb										WATER CONTENT, %			VOLUME, FTS		
		cuttings Bin	Bin	Est. Loss	Cuttings		Fines by Bag	Bag	Fines		Cuttings	Fines	Measured (1)	Theoretical (2)	Variation M/T		
					Wet	Dry			Wet	Dry							
121.1	105.0	6640	455	0	6185	5266					17.5		50.15	9.72	5.16		
145.8	105.0	6667	448	0	6219	5848					6.4		55.7	8.21	6.78		
166.7	105.0	3168	192	500	3476	3279					6.0		31.23	4.76	6.56		
178.8																	
												</					

Notes: 1) Measured Volume (ft³) = (Dry wt. Cuttings + Dry wt. Fines) / Dry Density.
 2) Theoretical Volume (ft³) = $\pi r^2 L = \pi \left(\frac{8.5 \text{ in.}}{12} \right)^2 \frac{L}{144} = 0.394 \text{ ft}^2 \times L \text{ (ft)}$

Remarks: _____

 WCC, Y1C025 Phase, IV

WOODWARD-CLYDE CONSULTANTS
LOGS AND DATA NO. 26
ROCK ANCHOR TEST

P. 1 of 3
Date 22/23 Mar
By RA

MEASUREMENT OF CUTTINGS
TEST DRILL HOLE NO. RE-1

DRILLED DEPTH ft.	DRY DENSITY lb/ft ³	WEIGHT, lb								WATER CONTENT, %			VOLUME, FT ³			
		cuttings Bin	Bin	Est. Loss	cuttings		Fines Bag	Bag	Fines		Cuttings	Fines	Measured (1)	Theoretical (2)	Variation M/T	
					Wet	Dry			wet	Dry						
0																
32.0	clay	no	measurements													
32.0	105.0	208	32	0	176	144						22.0		1.37	5.48	0.25
45.9																
45.9	105.0	1319	0	0	1319	1129						16.8		10.76	10.05	1.07
71.4																
71.4	105.0	2241	172	0	2069	1777						16.5		16.92	9.91	1.71
96.6																

Notes: 1) Measured Volume (ft³) = (Dry wt. Cuttings + Dry wt. Fines) / Dry Density.
2) Theoretical Volume (ft³) = $\pi r^2 L = \pi \left(\frac{8.5 \text{ in.}}{2} \right)^2 \frac{L}{144} = 0.394 \text{ ft}^2 \times L \text{ (ft)}$

Remarks:

WOODWARD-CLYDE CONSULTANTS.
 LOCKS AND DAM NO. 26
 ROCK ANCHOR TEST

P. 3 OF 2
 Date 24/25 MAR
 BY RQ+RT

MEASUREMENT OF CUTTINGS
 TEST DRILL HOLE NO RE-1

DRILLED DEPTH ft.	DRY DENSITY lb/cf	WEIGHT, lb								WATER CONTENT, %		VOLUME, FT ³			
		cuttings Bin	Bin	Est. Loss	cuttings		Fines to Bag	Bag	Fines		cuttings	Fines	Measured (1)	Theoretical (2)	Variation M/T
					Wet	Dry			wet	Dry					
96.6	105.0	direct volume measure											41.78	9.49	4.40
120.7															
120.7	105.0	direct volume measure											26.33	9.59	2.75
145.0															
145.0	105.0	direct volume measure											29.87	8.47	3.53
166.5															
166.5	105.0	direct volume measure											28.98	4.00	7.23
176.7															

Notes. 1) Measured Volume (ft³) = (Dry wt. Cuttings + Dry wt. Fines) / Dry Density.
 2) Theoretical Volume (ft³) = $\pi r^2 L = \pi \left(\frac{8.5 \text{ in.}}{2} \right)^2 \frac{L}{144} = 0.394 \text{ ft}^2 \times L \text{ (ft)}$

Remarks.

WCC, YTC025 Phase, IV

WOODWARD-CUYDE CONSULTANTS
LOCAL AND BIRM No. 46
ROCK ANCHOR TEST

P. 1 of 2
Date 1 Mar 79
By RQ & RM

MEASUREMENT OF CUTTINGS
TEST DRILL HOLE NO RE-2

DRILLED DEPTH ft.	DRY DENSITY lb/ft ³	WEIGHT, lb								WATER CONTENT, %		VOLUME, FT ³		
		cuttings Bin	Bin	Est. Loss	cuttings		Fines + Bag	Bag	Fines		Measured (1)	Theoretical (2)	Variation M/T	
					Wet	Dry			cuttings					
0														
45.1						no	measurements							
45.1	105.0	995	68	0	927	782				18.5	7.45	9.59	0.78	
70.2														
70.2	105.0	2236	170	10	2076	1752				18.5	16.70	9.92	1.68	
95.3														
95.3				250	250	217	spilled		estimate 15.0		2.07			
119.5	105.0	49	34		15	14	hose		estimate 8.0		0.13			
		direct volume measure					bin		(12.9)		47.78			
											49.98	9.59	5.21	

Notes. 1) Measured Volume (ft³) = (Dry wt. Cuttings + Dry wt. Fines) / Dry Density.
2) Theoretical Volume (ft³) = $\pi (0.5 \text{ in.})^2 (L) = 0.394 \text{ ft}^3 \times L (\text{ft})$
Remarks. (-) indicates water content for information only;
not used in calculations

WCC, Y1C025 Phase, IV

m - n

WOODWARD-CLYDE CONSULTANTS

LOCAL AND DAM NO. 16

ROCK ANCHOR TEST

P. 2 of 2

Date 2 Mar 79By RQ + RMMEASUREMENT OF CUTTINGS
TEST DRILL HOLE NO RE-2

DRILLED DEPTH Ft.	DRY DENSITY lb/cf	WEIGHT, lb						WATER CONTENT			VOLUME, FT ³		
		Cuttings Bin	Bin	Est. Loss	Cuttings		Fines Bag	Bag	Fines		Measured (1)	Theoretical (2)	Variation M/A
					Wet	Dry			Cuttings	Fines			
119.5	105.0	direct	volume measure						(15.5)		24.57	9.85	2.49
144.5													
144.5	105.0	direct	volume measure						(13.4)		32.27	9.85	3.28
169.5													
176.3	105.0	direct	volume measure						(11.9)		23.13	2.66	8.70

Notes. 1) Measured Volume (ft³) = (Dry wt. Cuttings + Dry wt. Fines) / Dry Density.
 2) Theoretical Volume (ft³) = $\pi r^2 L = \pi \left(\frac{8.5 \text{ in.}}{2} \right)^2 \frac{L}{144} = 0.394 \text{ ft}^2 \times L \text{ (ft)}$
 Remarks. (-) indicates water content for information only;
 not used in calculations

WCC, Y7C025 Phase IV